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DESCRIPTION

OF THE

ISLAND OF ST. MICHAEL,

COMPRISING AN ACCOUNT OF ITS

GEOLOGICAL STRUCTURE;

WITH

REMARKS ON THE OTHER AZORES OR WESTERN ISLANDS.

ORIGINALLY COMMUNICATED TO THE LINNÆAN SOCIETY
OF NEW-ENGLAND.

BY JOHN W. WEBSTER, M. D.
COR. SEC. L. S. N. E.

BOSTON:
PUBLISHED BY R. P. & C. WILLIAMS,
NO. 2, CORNHILL-SQUARE.
1821.

DISTRICT OF MASSACHUSETTS, TO WIT:

District Clerk's Office.

BE IT REMEMBERED, that on the eleventh day of October, A. D. 1821, in the forty sixth year of the Independence of the United States of America, R. P. and C. Williams, of the said District, have deposited in this office the title of a book, the right whereof they claims as proprietors, in the words following, *to wit:*

A description of the Island of St. Michael, comprising an account of its Geological Structure: with remarks on the other Azores or Western Islands. Originally communicated to the Linnæan Society of New-England. By John W. Webster, M. D. Cor. Sec. L. S. N. E.

In conformity to the act of the Congress of the United States, entitled. "An act for the encouragement of learning, by securing the copies of maps, charts and books, to the authors and proprietors of such copies, during the times therein mentioned:" and also to an act entitled, "An act supplementary to an act, entitled, An act for the encouragement of learning, by securing the copies of maps, charts and books, to the authors and proprietors of such copies during the times therein mentioned; and extending the benefits thereof to the arts of designing, engraving and etching historical, and other prints."

JOHN W. DAVIS,
Clerk of the District of Massachusetts.

PREFACE.

IT is not a little remarkable that a group of islands, situated as the Azores are, within eight hundred miles of the shores of Europe, should not have commanded the attention of naturalists, nor have induced some one to undertake an excursion to them for the purpose of investigating their geological structure. The only notices we have of them are brief, tending to excite the curiosity, rather than affording much positive information respecting them.

Adanson and Masson are, in fact, the only persons, who have left us any account of the natural history of the Azores, and their remarks extend only to botany and zoology ; in regard to the highly interesting phenomena which remain monuments of volcanic agency, and which prove these islands to be among the most recent formations of the globe, they are silent. The geology of the Azores may, with great truth, be said to have been hitherto entirely neglected; the general remark, that the islands are of volcanic origin, has been assented to, without the confirmation to be derived from an attentive examination of their rocks and mountains. The only work having for its object a particular account of the Azores, which I have met with, is the incorrect, and, in many instances, fabulous, "History of the Azores by T. A."* published in 1813

The desire of contributing towards a more perfect knowledge of these islands, and of making known to geologists their remarkable structure, induced me to communicate to the LINNÆAN SOCIETY OF NEW-ENGLAND some observations made during a residence of several months in the island of St. Michael, in the years 1817–18. As so few naturalists in the United States, have enjoyed the opportunity of examining volcanic formations, it was thought that a tolerably minute description of all the geological appearances observed would be interesting to them; the whole of the original communication has therefore been retained. I have thought it would be useful to point out the rocks of some well known European localities, which many specimens from St. Michael resemble. A reference to American localities would have been preferable, but I have met with no rocks in this country analagous to those described in this work. It has indeed been said that basalt occurs in the United States, but the rocks which have been thus called are widely different from the basalts of Saxony, or even those of Scotland and Ireland. In regard to the term *basaltic lava*, I have followed Daubuisson, and have applied it to such specimens only as closely resemble the basaltic lava of the isle of Bourbon.

---

* The credit of this work is given by the Azoreans, to Ashe, the author of "Travels in the United States." I was informed in St. Michael, that he had been a few days only in the city of Ponta Delgada, and visited no other place. On his arrival in England, he published the "History, &c." for a perfectly just account of which, the reader is referred to the Quarterly Review, for 1814.

To the geological description of St. Michael some account of the manners and customs, and of such religious rites and ceremonies of the inhabitants as I witnessed, has been prefixed ; and in the appendix I have given as much information as I could collect respecting the islands I did not visit.

Of the political changes that have recently taken place in the Azores, and from which beneficial results are to be anticipated, I have said nothing ; being desirous of limiting my remarks to the actual condition of the people during my residence among them.

Boston, October, 1821.

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ERRATA.

Page 117, line 12th—in a few copies for *par't* read *part.*

134, line 15th—insert a semicolon after *network.*

INTRODUCTION.

SITUATION AND EARLY HISTORY OF THE AZORES.

The islands, included under the general name of Azores, or Western Islands, are nine in number, and are called

San Miguel,	or Saint Michael;
Santa Maria,	or Saint Mary;
Terceira,	or Third Island;
San Jorge,	or Saint George;
Graciosa,	or Beautiful;
Fayal,	———
Pico,	or The Peak;
Flores,	or Island of Flowers;
Corvo,	or Hawk Island.

The group, in general, may be considered as extending from 37° to 39° 45′ of north latitude, and from 25° to 31° of west longitude. It is situated in the Atlantic Ocean, about eight hundred miles west from Cape Saint Vincent, and at nearly the same distance from the shores of Africa and America.

Saint Michael is the largest of these islands; Flores and Corvo are the smallest, and lie at a considerable distance from all the others.

The name Azores is generally said to have been given to this group from the birds, which were seen upon some of the islands when discovered. Various opinions are entertained as to the particular species of these birds, and it is to be regretted that no description, sufficiently accurate to guide the naturalist in his inquiries, has been left. It is probable, however, that they were a species of the order *accipitres* of Linnæus; and at this day the kite, *falco milvus*, is often seen on these Islands, and is called by the inhabitants *açor* or *milhafre*.

The discovery and early history of the Azores are involved in great obscurity. The accounts of the separate islands, which have come down to us, are not merely unsatisfactory, but often contradictory; agreeing only in the general facts, that they were explored about the middle of the fifteenth century, and that some of them were colonized by Flemings and Germans. In the royal library at Paris is a Spanish map, dated 1346, in which the island of Corvo is exhibited; and another dated 1384, which is in the possession of M. Walckenaer, and which formerly belonged to the Pinelli library, contains the island of St. George.* The map of Andrea Bianco, dated 1436, and deposited in the library of St. Mark, contains all the Western Islands.* It seems, however, to be the general opinion, that the Azores were inserted in these maps some years subsequent to that, in which they were first constructed.

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* See notes to 1st. vol. Pinkerton.

Most modern writers have been content to repeat the tradition, that Joshua Vanderberg, a Fleming, was driven upon the Azores by stress of weather, in a voyage to Lisbon in the year 1439; and that on his arrival in Portugal he announced their existence, calling them Flamingas, or Flemish Islands.† However correct this tradition may be, the attention of the Portuguese nation does not appear to have been directed to the Azores, till some years subsequent to that of their supposed discovery; when the enthusiasm, which prevailed for engaging in maritime adventures, induced the prince, Don Henry, to fit out an expedition. This event is said to have taken place in the year 1449, and Antonio Gonzalo, in his "History of the discoverers of the world," states, that they were taken possession of by the prince, who accompanied the expedition in person.‡

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* Quarterly Review, 1814, &c.

† This is denied by Thuanus, who ascribes the honour of the discovery, to Belancourt, who discovered the Canaries.

‡ Mod. Univ. Hist. vol. xiv.

Till within a few years, these have been the opinions most generally received, in regard to the discovery of the Azores; but a late writer has remarked, that the best account of this event "is given by Candido Lusitano, in his Life of Don Henry of Portugal, written in the Portuguese language, from which it has never been translated, and consequently is very little known."* It is stated in this work of Lusitano, that, in the year 1431, Don Henry directed Francisco Gonzalo Velho Cabral, a gentleman of good family, "to sail towards the setting sun, and on discovering an island to return with an account of it." The result of the first voyage of Cabral was the discovery of a cluster of rocks, which, from their appearance, he named *Formigas*, or Ants; a name which they still retain. On the return of Cabral to Lisbon, Henry was gratified with his success, although Cabral himself was somewhat discouraged at not having accomplished more. The prince urged a second voyage, which, although reluctantly undertaken by Cabral, eventually rewarded his enterprise, by the discovery of an island on the 15th of August, 1432.† To this island he gave the name of Santa Maria, and on his return to Portugal, he was created lord of it, by Henry.

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* Quarterly Review, 1814.

† Other accounts say 1447.

Santa Maria was soon colonized and cultivated. Not long after, a negro slave who had fled to the mountains, discovered, from the summit of one of them, land at a distance, which was shortly ascertained to be a new island. On the 8th of May, 1444, it was taken possession of by Cabral, who named it San Miguel.

To this event succeeded the discovery of the island of Terceira ; according to some authors, Cabral repaired thither in the year 1449 and founded the city of Angra.

The discovery of the island of Fayal has been generally supposed to have taken place in the year 1460, and the honour has been given to Martin Behaim, a German navigator. This opinion appears to have been, in part, confirmed by an inscription on the terrestrial globe, constructed and left by Behaim at Nuremberg, in the year 1492. But it is highly improbable that Fayal should have remained unknown till eleven years after the discovery of Terceira ; for those persons who visited the latter island would undoubtedly have discovered the peak of Pico, which is conspicuous at the distance of more than a hundred miles, and from which the island of Fayal is separated by a channel nine miles only in width. However this may be, there seems early to have been a considerable degree of anxiety on the part of the Flemings, to secure a settlement on some of the islands, and a colony was sent out, which settled in Fayal.*

In the year 1457, all the islands appear to have been subject to the crown of Portugal, and every method, calculated to increase and confirm the attachment of the inhabitants to the mother country, was adopted. Their trade was exempted from many duties, and they obtained some other immunities.*

From that time to the year 1466, no event of interest in the history of the Azores has been recorded. They continued subject to the crown of Portugal, and in this year were transferred by Alphonso V. to his sister the dutchess of Burgundy, who made a grant of the arms to Job de Huerter, the father in law of the geographer Behaim and lord of Moikirchen, who, having been driven from Flanders by war and famine, resided in Fayal.†

The union of the crowns of Spain and Portugal, in 1580, produced considerable excitement among the Azoreans, and they espoused the cause of Don Antonio, the illegitimate nephew of Henry, who was then urging his claims to the crown of Portugal at the court of Great-Britain. An expedition was fitted out by Queen Elizabeth to aid his cause, the command of which was given to Sir Francis

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* Mod. Univ. Hist.

† Pinkerton.

Drake. A part of this fleet was ordered to the Azores, under Sir Walter Raleigh, who took some small vessels off the island of Terceira.* One of the consequences of this action was the arrival of a body of French troops in Terceira, in 1583, commanded by De Chaste, who were defeated by the Spaniards.†

Six years after this, the Azores were blockaded by the Earl of Cumberland, who took several valuable prizes off the islands; but, in an attack upon them, many of his people were killed, and a mortality so destructive seized the remainder, that scarcely enough were left to navigate his vessels back to England.‡ An account of this expedition was published by Edward Wright, a distinguished mathematician attached to the service.

In the year 1586, Raleigh captured five vessels in the vicinity of the islands, and among his prisoners was the governor of St. Michael.‖

Other actions of minor importance took place near Graciosa and Flores, in the years 1591 and 1592.

The support of a Portuguese garrison on the Island of Fayal, being deemed an oppressive tax, the inhabitants petitioned the crown, for permission to defend themselves ; and in 1597 they experienced the most unhappy consequences of their parsimony. Sir Walter Raleigh, in conjunction with the Earl of Essex, was sent out by Queen Elizabeth to attack the islands, and every preparation was made, but by some accident the squadron was separated.* After waiting four days, Raleigh determined to attack the island of Fayal, which he succeeded in capturing.

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* Cayley's life of Sir Walter Raleigh, vol. i.

† Pinkerton. Thevenot's collection, vol. iv.

‡ Hume. Hackluyt, vol. ii.

‖ Hackluyt, vol. ii.

This event induced the king to resume the defence of the island, and the inhabitants were willing to submit to the inconvenience of a Portuguese garrison, which has ever since been kept on it.†

All accounts agree in regard to the state of the Azores at the time of their discovery, that they were uninhabited, that no quadrupeds or reptiles were seen upon them, and that the vegetation was luxuriant in the extreme.

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* For an account of this expedition see Purchas, vol. iv. Raleigh's history of the world.

† Mod. Univ. Hist.

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A

DESCRIPTION

OF THE

ISLAND OF ST. MICHAEL,

&c.

CHAPTER I.

GENERAL APPEARANCE—CUSTOMS ON LANDING—CITY OF PONTA DELGADA—HOUSES—STREETS—ROADS.

THE island of Saint Michael is the largest of the Azores; its form is irregular, and it extends, from the north west to the south east, rather more than forty eight miles; its greatest breadth is eleven miles, and its least, six.

The narrowest part of the island is that, which is under the highest cultivation, and which presents the most extensive portions of level land. It lies between the Morro das Capellas on the north west, and O Morro da Ribeira Grande on the north east; the Ponta Delgada on the south west, and the

Ponta da Galera on the south east. Between the two first points is included a considerable bay on the northern side of the island, and between the two last, a similar one on the southern side.

The general appearance of Saint Michael, when viewed from the sea, is rugged and mountainous; the coast, except in a few places, is bold and precipitous; and the bases of many of the mountains spread out till they are lost beneath the waters of the ocean. On approaching the shores, innumerable deep and extensive ravines are seen, from a few feet to many yards in width; while the land rises, for the most part, suddenly from the water's edge to the height, often, of more than an hundred and fifty feet, presenting a perpendicular wall of rock. In some places there is less abruptness, where the rocks are partially covered with earth, which has been washed over the edge of the precipice. Here and there, where a chasm exists in the rocks, or where the torrents have scooped out the earth and rounded away the projecting angles, views are obtained of the luxuriant plains and highly cultivated hills of the interior of the island. Now and then a more extensive prospect is enjoyed, of romantic scenery and rich vallies, interspersed with low, white cottages, shaded by orange groves, and surrounded by vineyards. In some places, a solitary cottage stands on the very edge of the precipice; in others, a few peasants have erected their cabins at the bottom of a ravine. One cannot but tremble for their fate, when he reflects that the former may be precipitated into the ocean by the terrible convulsions to which these islands are so subject, and that the latter may be overwhelmed by a torrent from the mountains.

The view from the anchorage on the south side of the island, where vessels ride about a mile distant from the shore, is uncommonly varied and picturesque. Immediately at the water's edge stands the city of Ponta Delgada,* the principal town of St. Michael. It takes its name from the point Delgada, a little to the eastward of which it is situated, and from the uniform whiteness of the houses, has, at a distance, an air of great neatness and even of beauty. The buildings rise above each other with great regularity as they recede from the sea, and the general effect is heightened by the numerous towers of the churches and convents scattered in various parts of the city. The land gradually becomes more elevated beyond the town, and clumps of orange trees and other evergreens, here and there intermixed, are more frequent as the eye reaches the open country, where they spread out in rich profusion. Numerous small conical hills are seen in the back ground, which are covered with a short, but verdant growth of heaths and ferns; and the view is bounded on each side by lofty mountains.*

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* Or *sharp point*. From the mean result of many lunar observations, the longitude of Ponta Delgada is found to be 25° 36′ west from London.

Every foreigner landing in St. Michael is conducted, under a military guard, to the castle of St. Braz, that his views in visiting the island may be declared, and his passports examined. He is then required to appear before the corregidor, who repeats the examination, and, if satisfied that no danger will result, grants him leave to remain on shore. The slightest deviation from this routine would subject a stranger to many inconveniences, and even imprisonment; an instance of which lately occurred. The supercargo of an American vessel went on shore to the house of his consignee, without having previously made his appearance before the governor, and corregidor; while at dinner, the house was entered by a detachment of soldiers, who seized and conducted him to a dungeon; in obtaining his release from which, the greatest exertions of his friends were for some days ineffectual.

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* On the very accurate chart of W. H. Read, Esq. published in 1808, the bearings of all the principal land marks from the anchorage are laid down; and mariners are directed in beating up to the anchorage "to keep close in shore, except off the points da Galera; there is no danger more than one eighth of a mile from the shore."—"High water at full and change at half an hour, P. M. The tide rises seven feet in spring tides. A regular tide prevails along the coast, but in the offing it is three hours later; the flood sets to the eastward."

In proceeding through the city to the residence of the governor, and corregidor, the favourable impressions, which the first appearance of St. Michael may have made upon a stranger, will be speedily dissipated.

The houses are generally three stories high, built of lava, and whitewashed. Notwithstanding the uniform whiteness of the buildings externally, they have an air of heaviness and gloom, and seem far better calculated for prisons than dwelling houses. The entrances to all of them are dark, but spacious; they are most commonly arched, and closed by two heavy doors, which open from the centre. On either side the entrance are store rooms, and all the windows of the ground floor, are strongly secured with iron grates; from the windows of the first floor above, which extend from floor to ceiling, "varandas," or balconies of stone surrounded by an iron or wooden railing, project into the street. Most of the varandas are furnished with lattice work, often from six to eight feet high, within which the females pass much of their time, screened from public view.

Glass windows have been used only within a few years, and they are even at this day comparatively rare. The only protection in the greater number of houses against rain and cold, are wooden shutters on the inside, with a few holes from one to two inches square cut in each. The temperature of the air is such, that it is rarely necessary to close even these, and to many of the cottages of the poor they are wholly wanting. Fires are never required, except for cooking, and a fire-place or stove, in any other apartment than the kitchen, is unknown.

The interior of the Portuguese houses, is too often as devoid of cleanliness and comfort, as the exterior is of beauty and neatness. The apartments on the ground floor are paved with broad flag-stones, and are most commonly appropriated to the storing of wine, corn, and merchandise. The mules and asses, are likewise kept on this floor, and are usually driven through the street door, to the foot of the broad stone staircase, where they are unladen.

The apartments immediately above the store rooms, are those occupied by the family ; the parlours, drawing and bed rooms, in most houses, being all upon the same floor. These rooms are lofty, the walls whitewashed, and adorned with a few miserable engravings of the royal family of

Portugal, of saints, and other similar subjects, in coarse mahogany frames: the remaining furniture is antique and massy. In one or more of the bed rooms are seen crucifixes of wood, ivory, or silver, on each side of which are vases filled with the most beautiful flowers of the season. A glass vessel containing holy water is hung up at the bed side, and a rosary on the bed post. Chairs, till within a few years, were almost wholly unknown, the people being in the habit of sitting cross-legged upon the floor, or upon a platform built on one side of the apartment and raised about a foot, called "estrado," which was covered with a carpet, and projected from the wall nearly to the centre of the room. The use of chairs has now become pretty general, but the estrado still continues in a few families.

Since the increased intercourse between the Azores, Great-Britain, and the United States, an evident change in the manners of the Islanders has taken place. A better taste in the construction and decoration of their houses has begun to prevail, and the heavy and inelegant articles of Portuguese manufacture, are daily giving place to the lighter and more convenient furniture from other countries. The houses of the wealthier classes, are far more cleanly than they are said to have been a few years ago, and in some of them every comfort and convenience is now found, united to a very considerable degree of elegance. There is still, however, a decided preference manifested on every occasion, for what is gaudy, rather than for what is truly valuable, or convenient. In some of the modern houses, a taste for decorating the walls of rooms with paintings in water-colours has been carried to the most extravagant pitch, and they present a fantastic assemblage of vases, fountains, trees, birds, columns, water-falls, centaurs, dragons, emblems of agriculture, &c. The execution of the paintings is, however, often very delicate and beautiful, and to adorn a drawing room of moderate size in this manner, has sometimes cost over two thousand dollars. Now and then, more simplicity is displayed, and the walls are merely stained of one uniform colour, surrounded by a neat border.

The dwelling houses of the better classes are in the more retired streets; those of tradesmen and mechanics are principally in *Rua dos Mercadores*, which runs parallel to, and near the shore. Here are a few shops scantily supplied with woollen goods, hats, hard ware, and groceries of the poorest kind. Merchandize of better quality is kept by the more extensive dealers and fruit-merchants, in a room in their dwelling houses, to be disposed of as occasion offers. Many articles are entrusted to women, who carry them to the houses in town, and travel over the island as pedlers; some also are sent to the nuns, who find many purchasers for them.

The streets are narrow, ill paved, and exceedingly filthy. They are overrun with hogs of an uncommonly large size, through the multitude of which it is often difficult to force one's way; they are seen wallowing in every passage, and sleeping on the steps of almost every house. Some of the streets are continued beyond the limits of the city, and terminate in roads of tolerable width. But except within a few miles of the capital, and of some of the principal villages, wheel-carriages cannot be used with safety.

In St. Michael new roads have been marked out, and are now making, but many of them must necessarily pass over lofty mountains of crumbling pumice stone, liable to deep and dangerous breaches from heavy rains; or must be carried along the edge, or at the bottom, of abrupt and frightful precipices. Many of the present roads are liable to become almost impassible, from the sudden rise of streams, over which there are no bridges.

The only safe mode of travelling is on asses; a few heavy and ill shaped cabriolets are owned by the "Morgados,"* but they are kept principally for visits of ceremony in the city. These vehicles are generally drawn by two mules abreast, one being harnessed within the shafts, the other, on which the postillion rides, without.

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* Those who inherit entailed estates.

CHAPTER II.

POPULATION—GOVERNMENT—"MORGADOS"—EDUCATION—MUSICAL TASTE—PRIESTS—INFLUENCE OF THE RELIGIOUS ORDERS—DUTIES AND HABITS OF THE PRIESTS—CEREMONIOUS MANNERS OF THE INHABITANTS—VISITS—PRESENTS.

THE population of Saint Michael is stated by Hassel to have been, in the year 1790, sixty one thousand and fifty eight; but, in the year 1818, it was generally considered to be about eighty thousand. The number of inhabitants in the city of Ponta Delgada is variously estimated, at from eight to twelve thousand.

The island is divided into three districts, viz. Ponta Delgada, Ribeira Grande, and Villa Franca. St. Michael and St. Mary are under the immediate control of a governor, who is a military officer, and resides in Ponta Delgada. He is appointed by the crown, and holds his office for three years ; at the expiration of which time a successor is sent out from Portugal or Brazil.

The principal civil officer is the corregidor, who is appointed in a similar manner, and for the same term of time.

In each district is a senate, composed of six members, including the judge of the district, who presides at the sittings, which are held twice in each week. The chief duty of the senate is to regulate the police of the island.

The resident Morgados, or proprietors of entailed estates, constitute a distinct class in the Azores, and have comparatively little intercourse with any other persons. A large proportion of them pass their time in a state of great sloth and ignorance, appearing to have few other sources of happiness than eating, sleeping, and hoarding money. All of them are wealthy, but appropriate a very small part of their income to the comfort of themselves, or benefit of others, and are striking illustrations of the Portuguese proverb, "cuspir sangue em escudella de ouro."* It is not uncommon for them to bury their gold and silver in some obscure spot, or to secrete it in the walls of their dwelling houses ; and it is only when the possessor is at the point of death, that these depositaries are made known to the immediate heir.

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* Literally—to spit blood in a gold basin,—to have much wealth and little enjoyment of it.

The Morgados are exceedingly slovenly in their dress; and the interior of their houses is desolate and dreary. Many of them, not having received any education themselves, allow their children to grow up in ignorance and idleness.

Until within a few years the only institutions for the instruction of children in the Azores, were either connected with some convent, or under the immediate control of the priests. Even in the best of these, the highest attainment of the pupil rarely exceeded the ability to repeat by rote a few prayers in a language which he did not understand.* The increasing intercourse, however, with

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* In the year 1773, "an impost of two reys,* was laid on each canari (*canada*) of wine made in Fayal and Pico, which amounts to something more than 1*s.* sterling per pipe and produces 1000 pounds per annum. This revenue was to be raised under pretence of supporting three professors, to be established at Fayal after undergoing an examination at Lisbon. But unfortunately for science and for the inhabitants of the island, the money was no sooner collected than it was applied to a very different use, and now serves to pay and support the garrison." "In consequence of this abuse there are no public institutions for instruction. There is a

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* About 1-12 of a penny sterling.

more enlightened nations, and the example of foreign settlers, who educate their children in their own houses, or send them to other countries for their improvement, appear to have awakened the ambition of some of the native Azoreans, who have begun to send their sons to England and Portugal; but it is, even now, rare to meet with a young person of any class, who can read or write his own language with tolerable accuracy.

The only science, in which the natives of the Azores appear proficients, is music; and of this they are passionately fond. It is rare to meet with one who does not sing, or perform on some instrument. The poorest peasant, as he trudges along with his asses, accompanies his voice on the viola, and the daughters of the Morgados, although often unable to read or write, display great taste and execution on the guitar, or piano. It is by no means uncommon to meet with persons, who, when blindfolded, and at a distance from a piano, will accurately distinguish and name each note struck on it by another performer.

The priests, friars, and nuns, constitute a large proportion of the inhabitants of these islands.

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professor, indeed, appointed, who has passed the examination, but as he receives no salary he poorly earns his bread by teaching the rudiments of Latin." *Forster's Voyages, &c.*

They are proverbially ignorant, and enervated in body and mind; and it is well known that many of the priests and friars, and most of the nuns, acquire the mode of pronouncing the set phrases of their missals, without being able to translate them, or to read in any other books.

The power of the religious orders is felt in every house, extending to the most common actions of life, and it has a paralyzing influence on all advances towards refinement in manners, or intellectual improvement. Every method, calculated to preserve it, is studiously sought, and none has greater effect than the ignorant state in which all classes are kept. Even were the people in general able to read, so long as this influence continues, their literary resources will be inconsiderable, as they are not allowed any books which have not been examined by the priests, and the use of all French works is strictly prohibited. The effect of this system was strikingly displayed not long since, when a supply of Bibles in the Portuguese language was received, from a society in England, but not one Azorean dared to admit a copy into his house, as they were told by the priests, that the translation had been made in England, for the purpose of subverting their established religion.

The majority of the priests have benefices in some church or parish, the income of which rarely exceeds five hundred dollars; many, however, depend entirely for support on the friendship of the pious, who employ them to officiate daily in private chapels, or to say masses for the repose of the souls of their deceased relations. For the performance of each mass the priest receives about forty cents. The duties of the priests are for the most part confined to the precincts of their parish, and in this respect they differ from the friars, who often change their place of residence, and travel over the islands. When not engaged at mass, they are seen lounging about the streets of the city, in the market-place, on the key, or dozing in the sun on the stone platforms in front of the churches. They are numerous at all entertainments, and generally compose the most social part of the company, often relieving the ennui of an evening party by their songs, or "modinhas," accompanying themselves on the guitar or piano with exquisite taste.

In the houses of the wealthy one or more rooms are appropriated to billiards, faro, and similar games, in which the priests take an active part; some of them, indeed, daily spend most of the time which is not required to be passed at the church, in these amusements, of which the islanders in general are passionately fond.

In the formality of their manners, and love of parade, the Azoreans are probably surpassed by no other people; a stranger, on landing among them, will be both amused and annoyed by the ceremonious behaviour of all classes towards each other. The wealthiest citizen, or the poorest labourer, will not neglect, as he passes, to take off his hat and bow, and would be highly offended were his salute not returned. So punctilious are they, that the shoemaker, tailor, and others, who depend for subsistence entirely on their daily labour, view the work done for their employers as a particular favour, which will not be repeated unless they receive a bow from them whenever they meet, and occasional presents.

Although an evident change in the manners of the islanders has taken place within a few years, there is still too much ceremony to render intercourse with them pleasant to strangers. Even intimate friends rarely visit each other without a previous, formal message requesting permission.*

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* The following message is sent: "Fas os meus compriméntos a Senhóra Dona —, e pedé licença para a Senhóra Dona —, hir a os seus pés esta tarde" (*make my compliments to her ladyship Senhora Dona —, and beg permission for me to*

Visits of ceremony are usually made soon after dinner, which among the Portuguese is at twelve o'clock, and the party is composed of most of the members of the family. The ladies are dressed in silks and satins of the most gaudy colours, with a profusion of gold ornaments, jewels, &c. and are always attended by one or more gentlemen in laced coats, and embroidered waistcoats, with cocked hats and swords.

As soon as notice is given of their arrival, the master of the house descends to the street door to receive and conduct the lady to the drawing room, where she is handed to the sofa, left vacant for her, and to which no one else dare approach; the lady of the house takes a chair on her right, the other members of the family seat themselves on her left; and in this manner, the visit is continued from one to three hours.

Evening parties assemble about five in the afternoon and are conducted with equal formality. The ladies are arranged on one side of the room, the gentlemen on the opposite; little or no conversation takes place, and they often occupy the same seat

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throw myself at her feet this afternoon.) To which is replied "Diz a Senhora Dona,— que a caza e coraçao estao as suas ordens" (*Tell her ladyship that my house and heart are at her service.*)

till the time of departure. Whenever any lady crosses the room, all the gentlemen rise and remain standing, till she resumes her seat. To the foreign families, who reside upon the islands, these visits, as may readily be supposed, are by no means agreeable, and they of course extend their intercourse no farther, than is barely sufficient to avoid giving offence.

The ceremony of making presents to friends and acquaintance at certain seasons of the year, is observed with great exactness by all classes. Thus, at Easter, it would be deemed highly indecorous, not to send to the physician of the family, poultry, pigs, fruit, sweetmeats, &c. The poorest person whom he has attended strives to obtain something to offer him, and would be offended if it were not accepted. At Christmas, and some other festivals, cakes of a particular kind are made in families and sent out to the butcher, tailor, shoemaker, washerwoman, and all other persons, who have been employed by them during the year. On Shrove Tuesday, the nuns send to all their acquaintance great quantities of almonds, comfits, and a kind of pancake called "malaçadas." Presents, often of great value, are made on these days, to public officers; and others, of less importance, to house servants.

CHAPTER III.

COMPLEXION—HABITS, &C. OF THE NATIVES—WOMEN—MARRIAGES—PEASANTRY—COTTAGES—ASSES, &C.—BEGGARS.

The natives of the Azores have generally a dark, sallow complexion, which is most conspicuous among the peasantry. They are well made and athletic, and their full, dark eyes have often great brilliancy. Their hair is abundant and black, their cheek bones are prominent; the nose inclines to aquiline, and the face is rather oval.

The common people are active, and undergo much bodily fatigue, often to a very advanced age, and for a trifling compensation. The best mechanics obtain but from thirty to fifty cents per day, labourers rarely more than ten; and house servants from twelve to twenty dollars per year. The labouring and poorer classes have generally a cheerful countenance, but are easily provoked to anger by the most trivial causes, and are exceedingly vindictive. Many of them expend a considerable part of their earnings at the licensed shops, where an inferior wine, made on the island, is sold at from four to eight *vintems** per bottle. They also drink a poor kind of rum called "cachaça" made in Fayal and Brazil. The shops where these liquors are sold, are distinguished by a green bush placed over the entrance. Women stand at the doors, cooking salted fish and a particular kind of sausages, called "linguiças," which are made hot with red pepper, and given to the customers, for the express purpose of inducing thirst. They seldom drink less than a bottle of wine, and commonly more than two, at a time.

In all seasons of the year the men wrap themselves in large cloth cloaks, one corner of which is usually thrown over the left shoulder. With the exception of the cloak, their dress is simple, and well suited to the mild climate in which they live. It consists of a short jacket and breeches of a coarse blue, or brown, cotton cloth, from beneath which, white linen, or cotton drawers hang several inches below the knees, both garments being loose and untied. Boots of unblacked leather reach rather more than half way up the legs, and the head is covered with a blue cloth cap, called "carapuça."

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* The *vintem* is equal to 1 7-20 *d.* sterling.

The cap has a brim in front only, projecting six or eight inches, and terminating at the sides in two sharp points standing up like horns; to the back of it a broad cape is attached, the ends of which, in rainy weather, are brought forward and buttoned under the chin. The cloak is deemed so essential to the respectability of the poorer class, that it is not uncommon for a peasant to postpone his intended marriage, until he has acquired the means of purchasing one.

The females of the Azores have not the clear, florid complexion so much admired in some other countries, but their countenances are not devoid of animation, and are often highly expressive. Their feet are remarkably small, and their gait is slow and graceful. Females of the better class are seldom seen in the streets, as it is esteemed highly indecorous for them to appear in public, unless accompanied by their fathers or brothers; even then, their faces are veiled, and they are wrapt in large blue woollen cloaks, or are dressed in a peculiar, and uniform black habit, called "manto," which equally protects them from the gaze of the multitude.

It is rare, especially on days of festivity, to meet a female, even of the lower order, who is not decorated with a pair of large ear-rings and a heavy chain or necklace, to which a crucifix or a small image of the virgin, is attached. These are always of gold, and are not purchased for the sake of display alone, but for a more praiseworthy purpose. Desirous of receiving a decent burial, to which the Azoreans attach the utmost importance, and fearful of consuming all their earnings, many of them invest a part in these jewels, from the proceeds of the sale of which, the expences of their interment are to be defrayed.

The country women are industrious, and, during the day, work with the men in the fields; when not employed in this manner they are busy at the loom, or with the distaff and spindle; but are wholly unacquainted with the use of spinning wheels. They also manufacture baskets of willow, mats, and other coarse articles.

In their marriages the Azoreans appear to have little regard to age; it is not rare to see a wife of twelve years, united to a husband of sixteen; and it is equally common for a difference of forty years to exist between them. Marriages are frequently determined on by parents without consulting their daughters. A gentleman, who wishes to marry, applies to the father, who makes every arrangement before his daughter is apprized of his intentions, and it is not often that she refuses compliance. If, however, the suitor is rejected by the father, he addresses the lady by letter, and commonly obtains her consent to elope to the house of some female friend or relation, whence the father cannot reclaim her. If an elopement cannot be effected, the lover procures from his mistress a written statement of her wish to marry him, which he carries to the corregidor, who immediately orders the father to consent, or proceeds in person to the house and demands her from him. She is conveyed to the church, and the priest is directed to perform the ceremony. After a few days, the father, who has gradually become reconciled, receives them to his house.

All marriages are celebrated in the morning, in the parish churches, which are open every day. The friends follow the happy couple, in procession, and each one receives from the priest, on entering the church, a lighted wax taper, which is held during the performance of the ceremony. After this they return home, and the remainder of that, and the three following days are spent in festivities. After marriage the lady continues to be called by the same name as before.

The poorest Azorean is hospitable and humane, a stranger in distress, will always be kindly received ; and a family who find it difficult to provide for their own support will cheerfully share their last loaf with him. Fortunately, however, all those necessaries of life, which the common people require, are obtained with comparative ease. Many of the peasants never taste any other animal food than pork, and even that but rarely; they subsist principally on fish, vegetables, and coarse Indian corn bread. Their most luxurious breakfast is made upon a thin soup, called "açorda," composed of water, vinegar, and lard, seasoned with a little salt, and an abundance of garlick; their dinner consists of a dish of boiled cabbages, beans, or yams. A peasant considers himself in easy circumstances if possessed of a hog, and calculates on the sale of part of it, for the payment of the rent of his cottage. Their hogs are reared at little or no expense, being left to run at large and seek their food in the streets and roads.

The cottages are generally built of mud or stone, and covered with thatch. The only partitions within some of them, are mats, suspended from the roof. The kitchen is frequently at a little distance from the cottage, and is the only place where fire is ever used, the outlet for the smoke of which is through the door. The kitchen utensils are few, even those are seldom made of iron, but of a coarse earthern ware, manufactured on the island, of clay brought from St. Mary. The floors of the cottages are composed of clay, on which the family sit in the manner of the Turks. At their meals they rarely use knives and forks, but eat with their fingers.

In almost every cottage, a clean and comfortable bed is always kept for the accommodation of strangers. It is covered with a snow white quilt of knotted cotton, and ornamented by linen curtains, trimmed with coarse lace, manufactured in the house from flax, which grows on the island. The beds, in common use among the country people, are stuffed with Indian corn leaves, prepared by drawing them singly, when dry, through the teeth of a comb; but the bed reserved for strangers is filled with the soft, silky root of a particular species of fern, which is abundant in some parts of the island.

Almost every family in St. Michael has one or more asses, which are the principal beasts of burden in common use. They are not less adapted to the state of the country, than to the poverty of the inhabitants. All the service, which in other countries is performed by horses, is here done by asses. They are rarely known to stumble, even upon the most rough and dangerous paths; and, though sluggish in their movements, perform long journies, and carry very heavy loads with little apparent fatigue, subsisting at the same time on the coarsest food. In addition to this, the females afford considerable milk, which is sold to sick persons at a high price.*

A journey of many miles on an ass is accomplished with great ease. The rider sits sideways on a kind of clumsy pack saddle, which covers nearly the whole back of the animal. Upon the saddle is placed a frame of wood, terminated at each extremity by two pieces about three feet in length, crossing each other in the form of the letter X; by grasping the upper part, the rider is enabled to retain his seat when ascending or descending a hill; and when on a level spot he can rest his elbows in the upper angles. The animal is not guided with a bridle, but his tardy pace is accelerated and directed by a driver, who follows on foot with a long pole, the extremity of which is armed with a piece of iron more than a foot in length, terminating in a sharp point. Whenever the animal goes too fast, or it is necessary to stop, the driver seizes hold of his tail, and pulls upon it with all his strength.

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* According to an official return made a few years since, the whole number of asses on the island was somewhat more than seven thousand.

Although the island is so well stocked with black cattle, sheep, and goats, as to allow of considerable exportations, few of them belong to the peasantry. Cows are mostly attached to the entailed estates, and the peasant, who hires a farm, in addition to a certain quantity of work to be performed for his landlord, is required to take charge of them; and convey the milk, butter, and cheese to town, where they are sold for the benefit of the Morgado, and the poor tenant receives no other recompense for his trouble than some slight abatement in his rent. The milk is carried to town in skins, on the back of asses, but from the agitation it undergoes is much injured on its arrival. Most of the families in the city prefer using the milk of goats; herds of which are kept in the vicinity, and daily driven into town, and milked at the doors of customers.

The streets of the city, and the roads, are usually much less infested with beggars, than a stranger, who had visited other Portuguese islands, would anticipate. Every Saturday, however, the number of those in the city is augmented, in consequence of the custom of some of the Morgados to distribute alms weekly on that day. Many devotees follow the same practice, in compliance with vows made during illness, or under dread of some threatened evil. The knowledge of this brings into the city the lame, blind, and diseased, who join the crowd collected in front of the house where the distribution is to be made. After receiving their pittance at one house, they move on in a body to the next.

CHAPTER IV.

MONASTERY OF SAINT FRANCIS—FRIARS—MODE OF BURYING THE DEAD—DOMINICANS.

The religious communities in the Azores are numerous. There are nine convents and monasteries in the capital of St. Michael, and a proportional number in most of the other islands.

The principal monastery in the city of Ponta Delgada is that of Saint Francis, situated on the western side of St. Francis's square; it is a large plain stone building, apparently of great age; and is built in the form of a quadrangle. The side fronting upon the square, is formed by the public chapel, the entrances to which are arched, and closed by ponderous iron gates. A colossal statue of the patron saint, who is represented clad in the habit of the order, with a crucifix in his hand, stands in a niche in the centre of the pediment. There is nothing in the exterior of the building, which attracts much attention, except its size.

The interior of the public chapel is spacious and lofty. The high altar, loaded with artificial flowers, large wax tapers, and other customary decorations, is immediately opposite the principal entrance. The walls and ceiling of the recess in which it stands, are divided into compartments, by mouldings richly gilded; and are adorned with paintings representing the life and death of our Saviour, and the principal events in the history of Saint Francis. There are niches also, containing statues, as large as life, carved in wood; and among these, two figures of friars are particularly striking.

The altar is separated from the body of the church, by a heavy carved railing of oak, within which are seats for the abbot, priests, and laymen, who officiate.

In advancing towards the centre of the building, we pass under the choir, which projects into the body of the church about one third of the length of the interior. In this the friars assemble, morning and evening, to hear mass; each of them has his particular seat, separated from the others by thick oak sides and back, richly carved, and now black with age. On each side of the choir is an organ; one of them is of a moderate size, and is ordinarily used. The other, which is used only on particular festivals, is not less remarkable for its great dimensions, than for the richness and variety of its tones. Besides the very perfect imitations of other instruments, which can be produced on this organ, a row of trumpets projects in front of it, and they are played, when required, by ingenious machinery. On one side of the choir, an image of our Saviour stands in a niche, the walls of which are covered with bones, dried hands, and other relics of saints. Pieces of wood are also kept there, and exhibited as portions of the true cross.

The floor of the church is composed of large square stones and is without seats; the populace, who are admitted to this part, kneel or sit cross-legged upon the pavement during the religious ceremonies.

Large and richly wrought lamps of silver, are suspended from the curiously carved and painted ceiling, and are kept burning day and night. Columns, from eight to ten feet square, rise from the pavement on each side of the church, to support the roof. Beyond these are other smaller chapels, and altars dedicated to particular saints.

Adjoining the church are the cloisters, which form three sides of a square, leaving an area in the centre, paved with broad flag stones. Beneath the area is an extensive reservoir for water.

The cells of the monks are rooms about ten feet square, opening into arched passages extending throughout the building. They are furnished with a small bed, chair, crucifix and cup of holy water; in some of them, however, the bed is wanting, the occupant having imposed upon himself the penance of sleeping on the floor; a species of mortification not uncommon among the more rigid brethren. In some of the cells are small libraries, belonging to the few friars who preach; a duty, however, which is performed only on particular festivals.

The trouble and fatigue of ascending to the top of this building, are amply repaid by the extensive view of the city, villages, and plantations, scattered over this part of the island. The mountains, at a distance, spread out as far as the eye can reach, affording a striking contrast to the boundless expanse of ocean, the uniform level of which is but occasionally interrupted by some passing vessel.

The brethren of the convent of St. Francis have many duties in common with the priests. They formerly heard confessions within the building, at night, but owing to some irregularities, which were the consequence of it, this is no longer permitted; and all persons, who seek absolution from them, and are desirous of remaining unknown, are heard at a small grated window on the street, the friar to whom the confession is made being within the walls. It is not unusual to see a person late at night muffled in a large cloak, his face to the wall, pouring into the ear of some ghostly father the overflowings of an upbraiding conscience.

The dress of the Franciscans consists of a long, black, woollen frock, or cassock, to the cape of which is attached a hood terminating in a sharp point. The head is shaved on the top, and round the lower part in a line with the tip of the ears ; a narrow belt only of hair being left, encircling the skull. They wear round the waist, or rather just under the arm pits, a white cord, and their feet are but partially covered with sandals. In bad weather, or when they go into the country, they are permitted to wear a low-crowned white hat, with a brim of enormous width ; but most commonly they walk uncovered.

The Franciscans are forbidden, by the rules of the order, to travel in any other manner than on foot ; an injunction which they obey in towns and villages, but evade whenever they are not liable to general observation. Indeed it is not very unusual to see a friar dismount from his jackass on approaching a town, and remount when at a short distance beyond it.

The friars of this order are chiefly supported by donations from the inhabitants; their vows binding them to poverty. The donations are daily collected from door to door by the lay-brothers, who are distinguished from the rest of the fraternity by the menial duties they perform, and are seen with long sacks, or wallets, on their backs, visiting each house in the city and neighbouring villages, crying "pao para os Frades," bread for the friars. They collect in this manner sufficient for their daily wants, as it is esteemed by the inhabitants a pious act to give them what they require, although they demand it with impudence, and receive it without thanks.

A small addition to the revenue of the convent, arises from fees for attending and chanting at funerals. Whenever a funeral is to take place, at which the friars are hired to perform, they assemble in front of the house of the deceased person, and their heads are then covered with the sharp pointed hoods before noticed. The dead body, wrapped in a friar's habit, which is esteemed peculiarly holy, is most commonly laid on an open bier, wholly exposed to view; but the rich are sometimes placed in coffins, shaped like trunks and painted white. The hands of the corpse, holding a bunch of flowers, and tied with white ribbons, are clasped over the breast. The friars, chanting a solemn dirge, precede the bier to the parish church, in the centre of which it is set down, tapers are lighted, prayers repeated, and the other usual catholic ceremonies performed; another chant is then commenced, during which the body is lowered into the grave, previously prepared immediately beneath the floor of the church, the flag-stones of which are so arranged that two or more can be taken up for the purpose. After throwing a small quantity of quick lime over the corpse, the sexton jumps down upon it, and with a heavy log of wood, similar to that used for settling the pavement of streets in other countries, applies all his strength to cause the earth to occupy the same space it did previous to the interment of the body, which must be crushed and shockingly mangled. The coolness and indifference, with which this barbarous act is daily witnessed by friends and relations, is truly astonishishing. All the earth having been returned, the flag-stones are replaced in the same order as before. As all bodies are interred beneath the pavement of the churches, it becomes necessary, after some time, when a new grave is dug, to remove the bones of bodies previously buried. The bones taken up, are thrown into a large room in the tower of the building, among a promiscuous heap of others, which have been accumulating for ages. The atmosphere of the churches, as will readily be supposed, is often very offensive.

The efforts of the British, and other foreign settlers in St. Michael, to obtain a small spot of land as a burial place for protestants, were for a long time obstinately resisted by the ignorance and superstition of the natives, but were finally successful.

To return to the Franciscans;—abstinence being one of their vows, they are bound to subsist upon the poorest diet; this is by no means indicated by their personal appearance. Most of them are large, and many, exceedingly gross and corpulent men. They are so celebrated for their rich soup, that when entertainments are given by the citizens, "Sopas dos Frades," or friar's soup, is sometimes procured from the convent as a luxury. On the other hand it is said that instances have occurred, where a scrupulous adherence to the abstinence and penance of Lent has nearly proved fatal.

Besides the convent in the city, the Franciscans have three other establishments on the island of St. Michael, and one or more in most of the other islands of the group.

The other principal monastery in Ponta Delgada is that of the Dominicans, or white friars; this brotherhood is distinguished by a white dress, differing but little in fashion from that of the Franciscans. They possess many valuable estates, and their duties are trifling; they attract little or no attention, and pass their time for the most part, in riding, feasting, and idleness. At one period, the Dominicans were no less powerful than wealthy; but towards the beginning of the sixteenth century, their influence began to decline, as the perfidious and cruel measures, pursued by them to maintain their authority, became known.

In St. Michael, as in many other places, the inquisitors are taken from this order. Although well known to be luxurious and indolent, they impose upon those, who confess to them, penances far more severe than is done by any other confessors on the island, and on this account they are selected by the most devout persons.

CHAPTER V.

LENT—AMUSEMENTS—PENANCE—PROCESSIONS—HOLY THURSDAY—PALM SUNDAY.

The severities of the Catholic faith are probably enforced in no country more rigidly, than in the Azores; and the season of Lent is passed in acts of penance and religious ceremonies. It is well known that, at this time, no person can make use of any other articles of food than fish and vegetables, unless a bull, or indulgence, is purchased. In the Azores, all Catholics are compelled to make this purchase, which cannot be avoided, as at this season they are required to make confession under pain of excommunication for neglect, and no priest or confessor will grant absolution, till the bull is produced.

As different degrees of indulgence are desired by different persons, the bulls, which are kept for sale in common shops, have various prices. Thus the liberty of eating eggs, butter, and cheese, is granted by those bulls, for which about ten cents are paid, and as the indulgence is extended to meats and luxuries the price advances. A regular supply of blank bulls is yearly received from Lisbon, and it is only necessary for the purchaser to cause his or her name to be inserted in that which is selected.

The last days of Carnival, or the season when animal food can be eaten, are spent in festivities. The consumption of delicacies and luxuries is so great on the Sunday immediately preceding Lent, as to have acquired for the day the appellation of "Domingo gordo,"* and instances of severe illness, and even of sudden death, among the nuns and friars, from repletion on this day, are freely spoken of in St. Michael.

A custom, not however peculiar to the Azoreans, still holds a place among the festivities of this season. Persons of both sexes amuse themselves with throwing at each other artifical fruit, usually lemons and oranges, made of wax, which are sometimes filled with scented water, but more commonly with a mixture of water, flour, and soot. Many persons walk the streets with small bags of elastic gum concealed in the hand, the tubes of which are so constructed as to encircle a finger, appearing but as common rings; others even carry large syringes; both these are filled with the liquids above mentioned. Whenever an acquaintance is met, the contents of the bag or syringe are thrown upon him; the same is done without ceremony to females who stand in the varandas, and the assailant not unfrequently escapes, with difficulty, from a bucket full of dirty water, with which they are prepared to reward his rudeness. Persons, who are not disposed to join in this foolish and often dangerous sport, remain at home; or, if obliged to go into the streets, are careful to walk in the middle of them, and to carry umbrellas for protection.

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* Literally—" fat Sunday."

Every Friday and Sunday afternoon, during Lent, a sermon is preached in the chapel of the Franciscan convent, to a crowded audience. After the sermon, when every one, but the friars, and a few persons who remain out of curiosity, has retired, the lights are extinguished and the doors locked. The almost instantaneous transition from light to darkness has a solemn and awful effect, which is increased by the feeble flame of the solitary lamp in the distance, left burning in front of the high altar. For a few moments the most perfect silence reigns, but it is soon interrupted by deep and dismal groans, which, increasing in frequency, are presently accompanied by beating of breasts, and lashes; these gradually become more audible, till in a short time the noise is truly terrific. It is caused by the friars, who, having put off their clothes, are busily engaged in scourging themselves with whips having six or eight thongs of leather, or cord, knotted, and often armed with shot, or small pieces of iron. Although previously informed of this act of mortification, or penance, the stranger, whose curiosity induces him to be present, cannot but feel somewhat appalled, and unwilling to change the station he may have taken, from the fear of stumbling upon some pious brother, from whose lash he would receive no very welcome salute. This barbarous castigation continues about half an hour, after which the doors are unlocked, and one feels no slight degree of pleasure on escaping.

Some of the most splendid pageants of the catholic religion take place at this season. The images, carried through the streets, on these occasions, are literally loaded with ornaments, many of which are of gold and silver, enriched with diamonds, rubies, emeralds, and other precious stones; promiscuously disposed with others, composed of tinsel, scraps of silk, and artificial gems.

One of these processions is from the convent of Saint Francis, and is called "Prociçao dos terceiros";[*] it is intended to commemorate the principal events in the lives of our Saviour, and of the host of Saints, whom the Portuguese worship, more even than the deity. All the principal citizens unite in this procession, and the most respectable and wealthy of them esteem it an invaluable privilege to support on their shoulders the biers, on which the images, all of the size of life, covered with jewels, ribbons, and other finery, are placed. The image of our Saviour bearing his cross is followed by that of Saint Francis, who appears ghastly and squalid, and as if in the last stage of disease after one of his long penances. The indulgence of Portiuncula, and the temptation of the Saint, are commemorated by a third bier, on which he is seen reposing among brambles and roses.[†]

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[*] Terceiros implies devout men, who are not friars, but yet wear the habit of some order.

[†] The substance of this legend is as follows. Saint Francis, having rebuilt a church at Portiuncula, obtained, in an interview with our Saviour, a promise of full pardon for all persons, who should visit the church after confession. He was, however, required to obtain the consent of the Pope, Honorius the third, who restricted the time when the visit should be made to twenty-four hours annually; but the day was not determined on. The Saint returned to Portiuncula,

To this succeed two figures; one of which is intended for our Saviour after his crucifixion; the other for Saint Francis, who is kneeling at his feet with outstretched arms, imploring to receive similar wounds. To express this, red ribbons are stretched from each of the hands, and feet, and from the side of the first image, to similar parts of the image of the Saint.* This group is followed by a ghastly figure of the Virgin Mary with sunken eyes, which are represented as pouring forth tears of blood. Numerous other figures are seen in dif-

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and, while in the garden behind the church, "a strong temptation came upon him," to subdue which, he threw off his clothes "and rolled, naked as he was, among the brambles. A great light shone around, the brambles were converted into rose trees, covered with flowers and without thorns, and a multitude of angels were seen, who summoned him to the church." Our Saviour met him there, and appointed the day when the indulgence should in future be sought. More than sixty thousand persons, it is said, have sometimes flocked thither on that day, to obtain pardon for their sins; and every year some of them have been crushed to death. *Quarterly Review*, 1819.

* The Franciscans affirm that, two years before the death of their patriarch, Christ appeared to him in the form of a seraph extended upon the cross, and imprinted upon him five wounds in the hands, and feet, and side; that, as Francis in all other things had been his living image, the resemblance might be made perfect." *Quarterly Review*, 1819.

ferent parts of the procession, and many of them are too horrid and disgusting to look upon a second time.

As it is esteemed an evidence of great devotion to take a part in this pageantry, it is distinguished by the number of male and female penitents who walk in it. These people are unknown to their nearest connexions, and even to each other. On the day of the procession, they repair privately to the Franciscan convent, where they are supplied with loose garments of coarse sackcloth, in which they envelop themselves from head to foot. A small opening only is left for the face, which is, however, carefully concealed by folds of black crape. Heavy iron chains are attached to their ankles, which they drag along the streets. They walk barefooted, and it is said that their progress through the city can sometimes be traced by marks of blood on the pavement.

In different parts of the procession many children are observed. They are dressed in brocade, and ribbons of all colours are tied about them. They wear short hoop-petticoats and silk stockings; wings are attached to their shoulders, and their heads are with difficulty kept erect under the weight of false hair loaded with jewels, pomatum, and powder. These children are intended to represent angels; the devout ladies of the place esteem it a duty to aid in decorating them, and lend their private jewels for the purpose. The friars head the procession, and the priests precede the Host, which is carried by the prior, dressed in his most gorgeous robes, beneath a canopy of satin richly embroidered with gold, and supported by four of the most respectable gentlemen on the island. The Host is guarded by soldiers on each side, and in this manner the whole moves slowly through the principal streets of the city, and in front of each convent. A most discordant effect is produced by the solemn chant of the friars, and the music of the military, both of which are incessant. The streets and balconies are crowded with people dressed in black, the colour worn during Lent; and as the Host passes, every one is required to kneel and remain uncovered.

A procession, very similar to the last, takes place on the second Sunday in Lent; it is designed, however, more particularly to commemorate the bearing of the cross. For this purpose an image of our Saviour, apparently bending under the weight of an enormous cross, is carried through the streets in the same manner as were the images of the first procession. The figure is dressed in a purple robe, its head is encircled with a crown of thorns, and the naked feet appear bloody. It is followed by priests, friars, and the penitents in sackcloth. In different parts of the city altars are erected, on arriving at each of which the procession halts, prayers are said, and a trumpet is sounded to remind the hearers of the last judgement. At the sound of the trumpet the penitents beat their breasts with violence. On this, and other similar occasions, the streets are strewed with flowers and branches of evergreens, and the inhabitants hang out, in front of their houses, silk and damask bed-quilts.

On Palm Sunday high mass is performed in all the churches and chapels, during which, branches of the palm tree, profusely decorated with artificial flowers, ribbons, and gold and silver leaf, are distributed by the priests and friars. Those persons, who are so fortunate as to obtain a palm, carry it home, and preserve it with great care, as a mark of divine protection and blessing.

On Holy Thursday the custom of confessing is very generally observed, the streets are crowded with people going to and from the churches, and every one considers it a duty to appear in full dress. After confession, high mass is said, and the sacrament is administered to many hundreds. A lighted wax taper is then presented to every person in the church, and the vicar, preceded by priests and friars, and followed by the people, deposites the Host in a small silver lamb, which, with many genuflections and ceremonies, is afterwards placed at the top of a pyramid, erected for the occasion on one side of the building. This pyramid is between fifteen and twenty feet in height, and is covered with wax tapers, which, when lighted, give it the appearance of a pyramid of flame. Two soldiers are stationed at its base, and two at each door of the church, which are, however, left open. The priests retire, and every thing remains in this state, till the resurrection of Christ is celebrated on the third day following.

In the afternoon of this day, the chief priest of each parish washes the feet of twelve beggars, and afterwards kisses the right foot of each one, presenting him at the same time a piece of money, and a bunch of flowers. Females of every class likewise esteem it a duty to visit the churches and chapels in the city, in their richest dress; and so general is this custom in St. Michael, that the poor peasants come from distant parts of the island for the same purpose. Many of them are unable to return home, and cheerfully pass the night upon the stone floors of the churches.

CHAPTER VI.

CATHEDRAL—GOOD FRIDAY—RELIGIOUS CEREMONIES—PROCESSIONS—FESTA DO ESPIRITO SANTO—CHRISTMAS.

THE largest and most splendid church in Saint Michael is the "Matris," or Cathedral, which stands near the market place, in the centre of the city of Ponta Delgada. Although this edifice, at present, exhibits marks of age, and of the powerful influence of the elements, it is probable, from some of the marble ornaments of its exterior which remain, that it was originally possessed of considerable beauty. The interior, indeed, was formerly distinguished for the marble columns, which still support the roof, but which were some years since covered with wood and painted. Many of the altars in the Matris are highly ornamented, and on the eastern side of the principal one is a small chapel, in which the consecrated wafers are kept; it is hence called "Capella do Sacramento." The entrance to this chapel is through folding doors of silver, constructed within a few years, at the expense of some of the wealthiest parishioners.

The ceremonies in this church on Good Friday are more grand and imposing than on any other occasion. The altars, stripped of their usual ornaments, are shrouded in black. A mass is celebrated early in the day, which, from the circumstance of wine and bread not being taken, is termed "missa seca," or dry mass. On this occasion a sermon on the passion of our Saviour is usually preached by a friar, who endeavours to describe the sufferings on the cross, at the same time illustrating his description by the most violent and grotesque gesticulations. Finding but little effect produced on the audience, a cloth, on which is rudely painted, of the size of life, a human figure wounded and bleeding, is displayed from the pulpit over the heads of the multitude, and the preacher at the same time cries in a loud voice, "O peccadóres pedi a Déos, que tome compaxáo de vós ; essas fáces náo merecém senaó bofetádas, batéi vóssos péitos, rogai a Déos que vós perdoe vóssas cúlpas."* On hearing this the people beat their breasts and faces, tear their hair, groaning and sobbing with all their strength. Relapsing soon, however, into their former state of insensibility, they are once more roused by the terrific banner, which is displayed as before, and the same scene recurs.

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* Oh sinners, implore God to have compassion on you; those cheeks deserve only blows, beat your breasts, ask God to forgive your sins.

The sermon is succeeded by a procession round the interior of the church, designed to represent the burial of Jesus. An image, covered with a pall, is placed upon a bier previously erected upon a stage within the railing of the high altar. After a short chant, the bier is carried by four priests, clothed in white, round the various altars at the sides of the church; it is preceded and followed by a crowd of priests and citizens, who are enveloped in clouds of incense, and bear lighted tapers, and crucifixes. As soon as the procession begins to move, the multitude within the church, as well as those without, kneel and beat their breasts. At every few steps, a child, dressed in the habit of a nun, is elevated above the crowd, and chanting in a most mournful strain "ecce homo," unrolls the painting of a ghastly head, streaked with blood; on every display of which, the beating of breasts and the groans are renewed. The bier and image are in this manner carried to the foot of an altar prepared for the occasion, in a recess guarded in front by an iron railing. This supposed sepulchre is opened, and the image formally interred, while the service for the dead is chanted. A certain number of the priests, previously designated for the purpose, throw themselves upon the steps of the sepulchre, while others kneel and hang around it, apparently in the deepest distress. After this, the gates of the recess are locked. A guard of soldiers is stationed in front of the sepulchre, and another guard without the church; who remain on duty till the time of the resurrection on the ensuing Saturday.

In the afternoon of Good Friday another procession takes place, when all the images which have been already noticed, are again carried through the streets: and, in addition, an attempt is made to represent all the circumstances in the denial, condemnation, and crucifixion of Christ, together with many other events recorded in the Scriptures. Men and women, the characters of some of whom are well known not to be the most pure, are hired to perform in this show, and are dressed and painted at the Franciscan convent, where the procession is arranged. Our Saviour is represented by a large wooden image, dressed in a purple robe; upon its head is a crown of thorns, and the hands, which are tied, bear a reed.

Two men, representing Herod and Pilate, march along in red boots, with splendid turbans on their heads, from beneath which an abundance of false hair hangs in graceful ringlets over robes of purple and ermine. Their long trains are held by children dressed as pages. The cock and Saint Peter have a conspicuous station, in company with Judas Iscariot. Children, dressed as in the procession described in the preceding chapter, carry silver dishes, on some of which are a sponge, hammer, and nails ; on others are human skulls, and thigh bones. Following the cross are two persons, representing the two thieves ; they are strangely dressed, and their arms are bound with cords. Their faces are concealed by pieces of black crape, and they are guarded by soldiers on each side. An image of Mary, the mother of Jesus, is carried on a bier ; her eyes are raised to heaven, and tears appear to drop from them, which are conspicuous at the distance of many yards. In another part of the procession are seen Abraham and Isaac, clothed in sheep-skins, Isaac bearing on his shoulder a bundle of faggots.

The procession, led by the friars, bareheaded, passes through every considerable church and chapel in the city, resting a few minutes in each of them, while the child who had appeared in the morning, again unrolls the painting of the bloody head, and repeats as before "ecce homo." The convents are visited in rotation, and the images are carried into the area of the public chapel of each, which is decorated for their reception; while the nuns, assembled at the grate, welcome their arrival with a solemn chant. This visitation of the churches commences about two o'clock, and is seldom completed before eight in the evening. A great crowd of people from all parts of the island is collected in each church, waiting the arrival of the procession, and many persons remain after its departure to hear a sermon; at the conclusion of which, a tremendous noise is made in commemoration of the earthquake and rending of the rocks at the crucifixion. In order to increase the confusion, the men are prepared with mallets and sticks, with which they beat upon the stone floors; and the women evince their zeal by slapping themselves on the face.

From Thursday noon, when the Host was placed on the pyramid at the cathedral, to the same hour on the Saturday following, no bells are rung, but the priests are summoned to their duties and devotions by a kind of rattle, called "matraca," which is a semicircular board, furnished with a knocker, and the noise, produced by it, is heard at a great distance.

On Saturday noon the priests repair to the sepulchre, which after a pretended diligent search, is declared empty; they then proclaim the resurrection. A discharge of musquetry, from the guard in front of the church, is the signal for a general salùte from the castle and all the forts, and great rejoicings ensue. The black curtains are removed from the altars, which now blaze with light; the images of the saints are displayed, and high mass is celebrated with the utmost pomp. The Host, which had remained at the top of the pyramid before described, is removed to the high altar of the church, and the tapers are extinguished.

On the following day an image is drawn up towards the roof of the church, till it disappears behind a curtain; this is to remind the spectators of the ascension of Christ.

Among the amusements of the peasantry at this time, is the "festa do Espirito Santo," or festival of the Holy Ghost, which takes place in every parish, and continues seven weeks. On each Sunday, during high mass, the priest places a crown of silver on the head, and a sceptre in the hand, of a peasant previously elected by the people. He is proclaimed "Emperadór," and is conducted to a seat beneath a canopy prepared for him on one side of the church, where he sits during the remainder of the service. On leaving the church a crowd attend him, strewing the roads, along which he passes, with flowers, and in return he bestows his blessing upon them by flourishing his consecrated sceptre.

It is usual for the Emperadór to have his cottage repaired, painted and white-washed, if he can afford it, or decorated with branches of myrtle, and flowers, to receive the numerous guests who return with him from the church, to dance and sing till late at night. The crown and sceptre are always deposited in the best room in the house, on a salver of silver; and tapers are kept burning about them. The dancing and singing are repeated every Sunday evening, with occasional bonfires, in front of the cottage. In every parish, there is a rude stone building erected in the most public road, the floor of which is elevated some feet from the ground, and an open arch on each side supports the roof. On the last, or seventh, Sunday of this festival, the Emperadór, early in the morning, takes his seat in this "theátro," as it is called; a table is placed before him, on which are bread and wine, and on his right and left are two or three of his particular friends. He remains here till night, during which time the pious bring offerings of bread, wine, eggs, and poultry, to be blessed by him. A certain portion of these are divided among the donors, and the remainder distributed in the evening to the poor. On the same day the populace elect the Emperadór for the ensuing year, to whom the crown and sceptre are delivered; he takes them home, and deposites them in a room prepared for their reception. The house of the Emparadór elect is open every Sunday till the next festival, on which he is publickly crowned, and proclaimed; during this time it is the weekly resort of all his friends, and acquaintance, who engage in dancing, singing, and various rustic games.

On Christmas eve the illumination of the churches is far more magnificent than on any other occasion, and at midnight a mass, called cock mass, is said in each of them. The streets are filled with people, who ramble from one church or chapel to another, and the noise and confusion, which continue all night, render it utterly impossible to sleep. The convents are the great centres of attraction at this time, as the nuns of each exert themselves, with a spirit of rivalry, to excel in the splendour of their chapels, and in their musical performances. After the usual catholic ceremonies on the following day at the Franciscan convent, an image of the infant Jesus, wrapped in swaddling clothes, is carried about the chapel in the arms of a friar, and the multitude press eagerly forward to kiss it. The religious ceremonies observed at the other great festivals of the church, although numerous, differ but little from those already described.

CHAPTER VII.

CONVENTS—NUNS—VISITS TO THE NUNS—BELLS—SUPERSTITION—CORPUS CHRISTI—SAINT'S DAYS.

THE city of Ponta Delgada contains four convents of professed nuns, and three "recolhimentos," or asylums for pious women and widows. Besides these, there are similar establishments in the principal villages of St. Michael, and in some of the other islands.

All the convents in St. Michael are irregular, gloomy, stone buildings, with small grated windows, and are constructed on the same plan as the monastery of St. Francis. The chapels constitute the entire front, and are surmounted by square towers at the angles. Each tower contains a spacious room, the sides of which are formed of lattice work, reaching from the ceiling to within a foot of the floor, having shutters on the inside.

The nuns are occasionally allowed to sit in these towers, and always assemble in them on days of religious processions, for the purpose of offering their prayers to the images which are then set down in front of each convent. The remaining sides of the buildings are formed by the cells of the nuns, and the extensive granaries attached to all these establishments. The enclosed areas are cultivated as gardens.

The most celebrated convent in Ponta Delgada is that of St. John; the nuns of this, as well as those of the convents Esperança and St. Andrew, wear a black dress, with a veil of the same colour, and a white cap of a peculiar shape. The nuns of the convent de Nossa Senhora da Conceiçao, wear a white habit, and are further distinguished by a piece of silk on the breast, on which a star is embroidered in silver or gold.

The nuns are supported, in part, by the sale of ornamental and fanciful articles, and of sweetmeats, and flowers made of feathers. The colouring of the latter is remarkably delicate, and true to nature. Each nun receives from the funds of the institution a small sum, but it is insufficient to maintain her with comfort; she is therefore dependant, on her friends without, for daily supplies of provisions, wine, &c. A nun of the humblest origin is anxious to live as well, and to appear as respectable as the daughter of the wealthiest Morgado. Her parents are not less ambitious, and exert themselves to obtain for her every comfort and luxury. Notwithstanding this increased expense, the poorest Azorean is desirous of placing some of his children in the convents, which is owing to a prevalent opinion, that, by assuming the habit and subscribing to the vows of a religious order, they are elevated to rank and respectability.

With impressions like these, a great proportion of the nuns have voluntarily submitted to a life of seclusion; but instances are by no means rare where compulsion, and a cruel abuse of parental authority, have effected it. In other cases, sisters, and younger brothers of the proprietors of entailed estates, have embraced the monastic life, when the small sum, which the eldest son is required to give them annually, has been insufficient for their comfortable support without the walls.

As visiters are never allowed to go within the grates, and the nuns are rarely permitted to go out of their convents, but little can be learnt of their peculiar customs. The only parts of the buildings, to which visiters have access, are the public chapel and parlours.

The public chapel is entered directly from the street, and is separated from that appropriated to the nuns, by an iron grating only, which extends from the floor to the ceiling. The nun's chapel is divided into two apartments, one above the other, and the grating forms the extremity of both. The separation can, however, be made more complete and the view of the interior be intercepted, when required, by folding doors on the inside. The high altar is at the extremity of the public chapel, and immediately opposite the grate; besides this, there are many other altars on the sides, and numerous images of Saints in niches, along the walls. The roof of this chapel is richly carved, and gilded in every part; and the walls are ornamented with a kind of mosaic, which, on close examination, is found to be composed of tiles of blue and white porcelain, each about six inches square.

Mass is daily celebrated at the altar of the public chapel, by a priest elected for the purpose, and paid by the nuns. On these, and other similar occasions, they are present in the upper room of their chapel, and chant the responses, while in general, but two or three persons are seen in the public chapel.

The lower part of the nun's chapel, being in reality a continuation of the public one, is paved with flag-stones, under which are vaults for their dead; it is seldom exposed to view except when the nuns receive the sacrament. The folding doors within the lower grate, are then thrown open and the nuns are obscurely seen, through the fine grating covering the apertures of the more massy grates, on the same floor with the audience. Mass having been said, the priest carries the consecrated wafer from the altar, and each nun in turn receives it from his hand, kneeling and presenting her mouth at a small silver door in the centre of the grate, barely sufficient to admit the arm of the priest. Having in this manner partaken of the sacrament, the nuns retire, and the folding doors are again closed; the upper grate alone remaining open as before.

The nuns are never allowed to leave their convent after having taken the black veil, unless serious indisposition compels them to seek change of air; even then, they are obliged to apply to Rome for a license, which is now generally granted, and extends to three years liberty. Novices, who are distinguished by a white veil, can at any time leave the convent with a license from the bishop, and they are not unfrequently married. Some, however, become so much attached to the convent in which they reside, that they never leave it, although not professed nuns.

The morals of the nuns are freely spoken of in the Azores, as exceedingly lax: they generally have particular favourites among the young men of the islands, and are highly gratified by visits from strangers and foreigners. They have frequent masquerades within the walls, which visiters are permitted to witness through the grates.

During Lent crowds are attracted to the convents by the vocal and instrumental music of the nuns, which is performed in the upper part of their chapel, and is continued almost uninterruptedly from Ash Wednesday, to Easter Sunday. During this time, the greatest exertions are made by the sisters of each convent to surpass all the others. They do not confine themselves to sacred music, nor to those instruments only, which, in most other countries, are seen in the hands of females, but perform with rapidity and taste on all that usually compose a full orchestra.

Whenever a person desires to visit a nun, a note is put into a box, turning upon an axle in a hole cut in the wall near the gate; the nun, on receiving the note, names the time when she will, in her turn, have the use of the parlours to which visiters and friends are admitted. These visits are generally made in the afternoon. Each parlour is divided into two parts by a thick wall, in the centre of which a space of about eight feet square is left, guarded on both sides by iron grates. The distance between the grates just allows the fingers of persons on the opposite sides, to touch, when the arms are fully extended. The part of the room within the grates communicates with the cells, and is that in which the nun appears, while the visiters sit in the other part, to which they ascend directly from the street. The nun usually invites some of her companions who sing, or play on the guitar, to amuse her guests, and they sit cross-legged on the floor within the grates, no chairs being allowed them. Benches or chairs are always provided for the accommodation of the visiters, but the domestics, who usually accompany them, sit on the floor; they mingle however, in the mirth and jests of their superiors, and accost the nuns by their first names, with perfect familiarity. Conversation is carried on with nearly as great ease and spirit, as if there were no distinction of rooms, and indeed with far less ceremony than in the private parties before described. The only restraint appears to arise from the dread of certain nuns, termed "escutas," or listeners, whose duty it is to keep without, and report to the abbess whatever they hear. A number of these are also daily detached to walk the corridors, and observe every proceeding within the convent. At an early hour tea is prepared in the inner room by the nuns, and is placed on a tray, with the usual tea equipage, cakes, an abundance of sweetmeats, &c. in a box revolving like that at the gate, in an opening in the wall. On the box being turned, the servants, who have accompanied the visiters, hand the tray to the company, and likewise help themselves, partaking freely of every delicacy in common with their superiors. With all this strange mixture of formality and freedom, there is much sociability, and, to a stranger, no inconsiderable amusement. At sunset, the bells of the convents, as well as those of all the churches and chapels in town, are rung for vespers, when the visiters depart.

There is scarcely an hour in the day, when some of the bells are not heard in St. Michael; a stranger is daily roused by them in the morning, and they often prevent him from sleeping at night. At morning, noon, and night, they are rung as signals for devotion; immediately on hearing them, every person takes off his hat, let him be in the street, or elsewhere, mumbles over certain prayers, and even in the midst of the most important business the ceremony is on no account omitted. The bells are, however, rung more for the deliverance of the souls of the dead from the pains of purgatory, than for any other purpose. Most persons, when seized with alarming illness, bestow a sum of money, proportioned to their ability, on some church, that masses may be said, and the bells rung for their recovery, or, in case of their death, for the repose of their souls. On the day of the annual supplication for all souls in the month of November, the bells in all the churches are rung incessantly during twenty-fours hours.

The Azoreans are singularly exact in the observance of all the external forms of their religion. They are rigidly attached to some rites and ceremonies peculiar to themselves, and adhere to others, now almost entirely neglected in the mother country; natives of which, who visit the islands, express as much astonishment at the superstition, as at the ignorance of the inhabitants.

Penances of great severity are frequently imposed by the priests, and others are voluntarily undertaken by the devout. Next to fasting, prayers, and stripes, no penance is more common than to walk barefooted over the island, and to pray in every church and chapel, and before every image and cross. Ladies of great wealth and respectability impose upon themselves a still severer species of mortification, which consists in wearing round the waist and next to the skin, both day and night, a net-work of iron wire covered on the inside with shart points. This is called a "supplicio," and persons have been known to wear it during many years; others have carefully concealed it from the knowledge even of their most intimate friends, who have discovered it only after the decease of the penitent.

Whenever the Host is to be administered to a sick or dying person, it is carried from the church by the vicar under a canopy of red damask, supported by four priests; it is preceded by others bearing the censer and crucifix, and is followed by a promiscuous rabble. The approach of the motley group is announced by the sound of a small bell carried by the sexton, and all persons who are in the streets, through which it passes, uncover their heads, and kneel. Should the bell be heard during an evening or dinner party, the company rise, the music ceases, and every person present repairs to the windows and balconies, kneels, and crosses himself. If it happens in the evening, the candles are carried to the windows, where they remain till the Host has passed by; the dancing or conversation then proceeds as if no interruption had taken place.

Some years since, a wooden image, supposed to be a very perfect likeness of Christ, is said to have been miraculously bestowed on the inhabitants, for the purpose of establishing the convent of Esperança. It was deposited in that convent, and entrusted to the care of one nun selected for the purpose, and at her decease a successor was chosen, who still watches it both day and night. A part of her duty is to collect the miraculous perspiration believed to exude from it, which is diffused through water and given as a panacea to the sick. More gold, silver, pearls, and precious stones are bestowed by the pious on this image, than on any other in St. Michael. Offerings of great value are continually made to it by the wealthy, and the poor lay upon its altar bread, wine, tapers, oil, or whatever they can conveniently dispense with. A gentleman of Ponta Delgada lately bestowed upon it a splendid silk mantle, piously embroidered in gold by his own hands. Round its waist is a cord composed of gold and silver, with pearls and diamonds of great value. The diadem, breastplate, and a few other ornaments, composed of the same materials, are valued at twenty thousand crowns.* On the evening preceding the festival of Corpus Christi, this image is placed upon the high altar of the convent of Esperança, and a brilliant display of fireworks takes place, the expense of which is defrayed by the heir to one of the richest entailed estates, in consequence of a vow made by one of his predecessors during illness. On the following day, the image is carried in procession through the city.

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* That these are true gems, I had an opportunity of satisfying myself a few days previous to the festival of this

The endless catalogue of saints worshipped by the Azoreans, makes such frequent demands on their time as to occasion no slight interruption to the common business of life. Every day in the year is dedicated to some saint; and on many saints' days no work is done; but, after hearing mass, most of the people engage in dancing and amusements. It is customary to give a child the name of that saint, on whose day it is born; the only exception being in favour of the eldest son, who receives the name of his father.

saint, when the ornaments were exhibited at some private houses. I was told that a person in Ponta Delgada had offered one million of dollars for the jewels alone.

CHAPTER VIII.

CLIMATE—AGRICULTURE—VEGETABLE PRODUCTIONS—FRUITS—BIRDS—FISH—REPTILES.

The climate of the Azores is more temperate and delightful, than is generally supposed. The severe gales of wind, so often experienced by vessels crossing the Atlantic, when at a comparatively short distance from these islands, have given currency to an opinion that they are far more subject to storms and variable weather, than is actually the case. From the want of correct observations, however, it is impossible to arrive at any satisfactory conclusion in regard to the frequency and extent of storms which have been encountered in this quarter; but there are some reasons for believing that many, which are felt in the islands lying to the north west, do not extend to the islands of St. Michael and St. Mary. This opinion is, in part, derived from the report of intelligent masters of vessels, who, during my residence in St. Michael, often spoke of tempestuous weather, which they had experienced two or three days previous to their arrival; while on the island the weather had been perfectly serene. Although it is probable that St. Michael is not subject to so frequent storms as some of the islands in the group, yet it is not wholly exempted from them. ~~Severe gales of~~ wind occasionally occur, accompanied by torrents of rain, causing great changes among the mountains, washing away the loose masses of pumice, and leaving the rocks in many places entirely destitute of soil.

None of the islands are ~~subject to sudden or~~ great variations of temperature, and the extremes of heat and cold are never felt in them. The thermometer rarely indicates a temperature below fifty degrees of Fahrenheit's scale, or above seventy five. The annexed table shows the state of the thermometer and barometer in the open air, during six months, from October to March inclusive.*

The state of agriculture is very low. The mildness of the climate, which requires little or no provision against inclemencies of the weather, the da, Octr. 1817 to March 1818.

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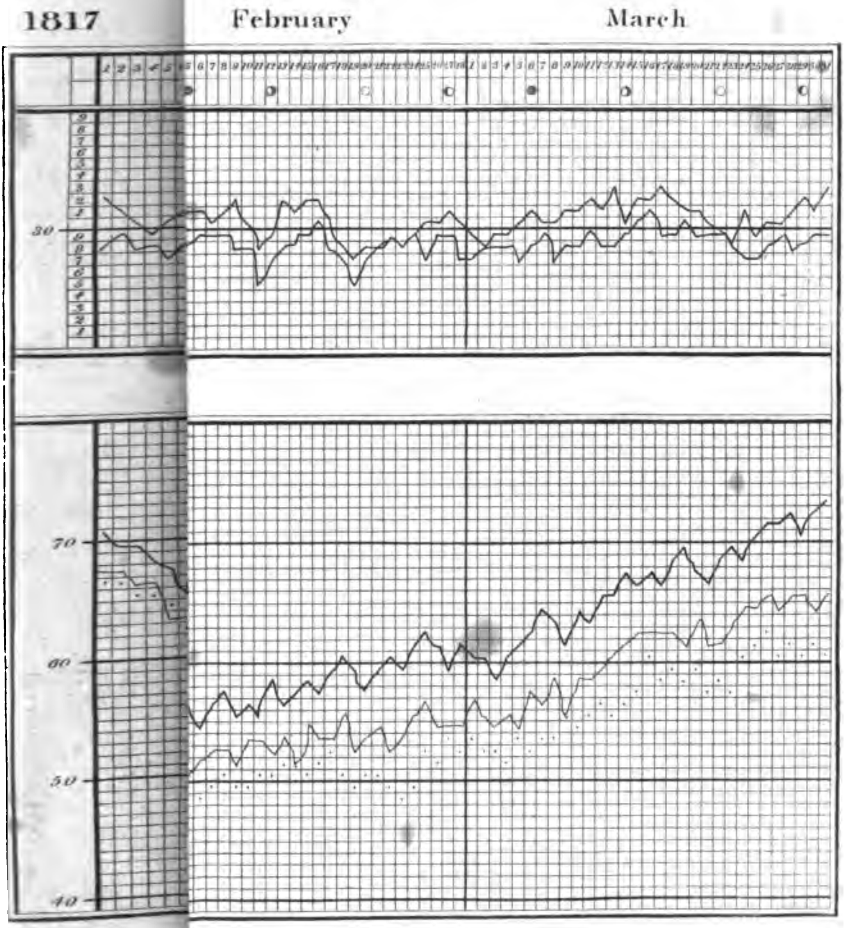
* The instruments were placed in a very favourable situation, about fifty feet above the level of the sea.



facility with which the means of sustenance are obtained, a constitutional disinclination to labour, together with an hereditary aversion to the introduction of modern improvements, all tend to retard its progress. The greater part of the islanders having, moreover, no personal interest in the soil which they cultivate, exert themselves no more than is absolutely necessary in committing the seed to the earth, leaving the result almost entirely to nature. The entailment of estates has probably a more powerful influence than any other circumstance, in preventing the adoption of more efficient methods of culture. No inducements are held out by the Portuguese government for improvements of any kind, nor do the proprietors of the estates, many of whom reside in Portugal, appear to take any other interest in their plantations, than is excited on the receipt of their yearly rents. To the Azoreans may be applied the remark of a great modern traveller* in regard to another Portuguese colony; "unhappily, the real welfare of the inhabitants does not correspond with the advantages, which nature has lavished on this spot. The farmers are not proprietors, the fruits of their labour belong to the nobles, and those feudal institutions, which for so long a time spread misery throughout Europe, still weigh heavily on the happiness of the people."

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* Humboldt.

The land is so fertile that, although it is imperfectly broken up, and but little manure is spread upon it, two crops are annually obtained. After the crops are gathered, the fields are slightly ploughed in the month of September, and then sowed with the common blue lupine. This plant grows rapidly, and, in about three months, having attained a sufficient height, it is turned in, and thus forms the most common, and at the same time a cheap, and efficacious means of enriching the soil. The experiments of a few foreign settlers in St. Michael have satisfactorily proved, that with very little additional trouble and expense, a constant succession of crops throughout the year may be obtained.

Although so little attention is bestowed on agriculture, the crops of maize, (Indian corn) beans, and potatoes, are very great. When the corn, which is of the yellow kind, is nearly ripe, the ears are broken from the stalks, and the husks are turned back. They are then collected into bundles and fastened to poles, from ten to fifteen feet high in such a manner as to form very regular pyramids. By this arrangement the corn is exposed to the sun, and air, and dries in a much shorter time than when left on the stalks.

The quantity of corn, annually exported from St. Michael to Portugal and its colonies, is about three hundred thousand bushels; which is estimated to be about one third part of the whole quantity produced on the island.

The wheat is heavy, and abundant; it is threshed in a very rude manner. A space in the field, being cleared from rubbish and loose stones, is thoroughly beaten, till it is reduced to a uniformly level and hard surface. Upon this spot the wheat sheaves are arranged in a circular manner, and a long board, armed with sharp points on its under side is dragged over them by oxen; the driver standing upon the board, which is also loaded with heavy stones. The sharp points cut the straw, and detach the grain; the straw is then raked off. None of the land is laid down to grass, and hay is consequently not used in St. Michael; the horses, and other animals subsisting on corn leaves, grain, and pulse.

During the harvest, the ears of a stranger are exceedingly annoyed by the noise of the carts used by the country people. The wheels, which are formed of large, clumsy pieces of wood, bound together with iron, are fastened to an equally clumsy axle-tree, and both turn together in a round hole cut in a beam, crossing the bottom of the cart. Grease is never applied to them, and they groan and creak to a degree that is almost deafening.

All the ordinary vegetables of Europe thrive in the Azores with little care, and the onions are remarkable for their size and mildness. Sweet potatoes, *(convolvulus batata,)* are tolerably abundant, and the Indian arrow root, *(maranta arundinacea,)* grows wild in every part of St. Michael. At present, the arrow root is almost entirely neglected by the natives, but some of the foreign families prepare small quantities of it, for their private use. The root in its natural state is extremely acrid to the taste, and, if chewed, causes a profuse salivation; when applied to the skin for some time, it produces heat, redness, and pain. The preparation consists in separating the fecula by careful and repeated washings after the root has been grated; but the effects produced by handling the root, are so unpleasant, that persons can with difficulty be hired to conduct the necessary operations.

The yam, *(dioscorea sativa,)* which grows in considerable quantity in low and moist situations, is an important article of diet to the peasants. This root, however, does not attain in St. Michael the size that it does in the West Indies, and some other places.

Most of the fruits of Europe are found in all the Azores, excepting the apricot, peach, and plum; the first of which, is productive only in Fayal, and the two last flourish in St. Michael only in some particular spots. Strawberries, blackberries, and a species of bilberry, called *uva da serra,* are abundant, but many attempts have in vain been made to propagate the gooseberry and currant. Oranges, sweet and sour lemons, sweet and sour limes, grapes, bananas, melons, goivas, arraças, figs, pomegranates, prickly pears, the large Spanish chestnut, and the English walnut, are common in most of the islands.

Many flowering plants and shrubs have been introduced from other countries into the gardens, in the larger islands, and, in the months of December and January, the air is perfumed by the geraniums, myrtles, and roses, then in full flower. The gardens of some of the foreign settlers are daily becoming more interesting, and at present some of them are adorned with the palm, dragon tree, and many tropical plants. The coffee tree and sugar cane have in some instances, with care and attention, been productive, but are cultivated chiefly as curiosities.

The birds of the Azores are numerous, and many species are not less beautiful in plumage, than sweet in song. Of these, the canary, and toutinegra are most common; the former is of a greenish grey color, the breast only being yellow. By domestication the dark tints gradually disappear, and the bird becomes of the delicate yellow, or white, for which, in addition to its note, it is so much prized abroad. The toutinegra is about the size of the canary, its body is of a grey color, and its head black; its note is uncommonly clear and melodious.

The black bird of the Azores is also much prized, both as a songster and as an article of food; the bright yellow of its bill, legs, and eye-lids, is singularly contrasted, with the deep black of its plumage.*

The variety and abundance of fish at St. Michael, are probably no where exceeded. The market is daily supplied with this article, so essential in a country, where the religious faith so often requires the use of it. Some of the most disgusting zoophytes, are eaten by the natives; and the polypi are esteemed as great delicacies by all classes. On the shores, lobsters, crabs, and some smaller shell fish are taken, and the conchologist finds numerous interesting specimens among the rocks and sand. The lower part of the rocks, where washed by the waves, are quite encrusted with corallines, patellœ, and the lepas anatifera or barnacle.

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* The *merula leucocephala* of Brisson, is sometimes met with, the white spots upon which, the islanders in their love for the marvellous, believe to be the effect of art, and it commands a high price.

It is a remarkable but well established fact, that no venomous animals, or reptiles, are known to exist on the island of St. Michael, and when carried thither, they are said to die soon after. A few years since, the master of an American vessel carried out some frogs, at the request of a gentleman residing on the island; they were put into a small pond, but, after a few months, none of them were found alive.

CHAPTER IX.

ORANGE GARDENS—PURCHASE OF FRUIT—IMPORTS—GATHERING AND PACKING FRUIT—VARIETIES OF LEMONS AND ORANGES—GRAPES—VINTAGE.

The oranges of St. Michael are celebrated for their fine flavour, and abundant sweet juice; when left to ripen on the trees, they are inferior to none in any part of the world. The lemons have less juice than those of some other countries, and the demand for them is inconsiderable. The orange and lemon trees blossom in the months of February and March. At this time, the deep and glossy green of the old leaves, the light, fresh tints of those just shooting forth, the brilliant yellow of the ripe fruit, and the delicate white and purple of the flower, are finely contrasted with each other, presenting one of the most beautiful sights imaginable. The trees generally attain the height of fifteen or twenty feet; they are planted with little regularity, and are permitted to grow with unrestrained luxuriance. There can be no doubt that, if proper care and attention were paid to them, crops far more abundant than the present might be obtained. No precautions, except occasionally the application of a thin coat of tar, are ever taken to prevent the destructive attacks of insects, and injuries from other causes.

The orange plantations, or, as they are termed, "quintas," are surrounded by thick stone walls, frequently more than twenty feet in height, and the more extensive ones are subdivided by lower walls within. In addition to this, are one or more rows of lofty evergreens, as a defence to the fruit trees against the violence of the wind; notwithstanding which great loss is sometimes experienced. So much shade is caused by the surrounding walls and evergreens, that the ground in the orange gardens is always damp, and the flavour of the fruit is greatly impaired.

The usual produce of a good tree, in common years, is from six to eight thousand oranges or lemons. Some instances of uncommon productiveness have occurred; a few years since twenty-six thousand oranges were obtained from one tree, and twenty-nine thousand have been gathered from another. These quantities have never been exceeded.

The produce of the fruit gardens, in general, is purchased of the Morgados, or their agents, by the resident English and American merchants, who export it; very few of the natives being willing to engage in these speculations. The merchant who intends to ship fruit, employs a certain number of men during the season, who are well acquainted with all the gardens on the island, and whose duty it is to report to their employer the state and value of any garden, he may propose purchasing. For this purpose these men visit the garden, and, from long habit, are able to form a very correct judgment of the quality and probable quantity of the fruit, while yet on the trees. In consequence of great competition, the merchant, who is constantly on the alert, as soon as he sees or hears of a garden, which is known to produce good fruit, despatches one or more of these men, called "cabeças," to the proprietor, with a request that they may be permitted to examine the garden. Should the fruit not have been promised to another, permission is granted, and the cabeças of the merchant, in company with those of the proprietor, estimate the value of the fruit. The calculations of the merchant, and the price he is willing to pay, are often grounded solely on the report of these men, and by them made known to the proprietor, who accepts or declines the terms, as the state of the market may warrant. This mode of purchasing is called "comprar a fruta no ar," buying fruit in the air; it is attended with great uncertainty, and risk, being often done some months prior to shipment, and sometimes, even when the fruit is perfectly green. The purchaser is also constantly exposed to great losses, from the destruction of the fruit by rats, thieves, and storms. It is by no means rare, after a strong wind, to see the ground covered with oranges, which in most instances prove nearly a total loss, being sent to the market-place in the city, where they are sold for a mere trifle. No oranges, that fall to the ground, are ever shipped. From these causes, the price of fruit is daily advancing from the time of the purchase to that of shipping it.

Another and less hazardous method of purchasing is by the hundred as picked; this, however, is rarely done, by reason of the competition before noticed, each merchant endeavouring to secure to himself, early in the season, as many gardens as possible.

The season for shipping fruit is from the month of November to that of May; during which time, small vessels are almost daily arriving, having been previously ordered out from America and England, by the merchants residing on the islands. Many vessels, also, on their passage across the Atlantic, stop at St. Michael and Fayal for such supplies as they may require, and frequently purchase large quantities of fruit.

Till within a few years, the annual shipments of fruit to Russia were very considerable; but at present they are small compared with those to Great-Britain and the United States.

The imports from Great-Britain, are principally woollen, cotton, linen and silk stuffs, hosiery, hats, earthen ware, and coals. Lumber, fish, oil, lard, beef, butter, cheese, and candles, are received from America. These articles are paid for by the merchant partly in money and partly in fruit. Cargoes, which arrive after the fruit season, are often landed and stored; the vessel leaving the island, to return again when the new crop is ready for exportation.

All vessels arriving at St. Michael come to anchor in an open roadstead, and are often compelled to slip their cables and stand out to sea when strong winds blow towards the shore. The want of a good harbour is severely felt; and although nature has done much towards forming one, the

Portuguese government has shown little inclination to complete her work, which might be accomplished at no very great expense. At present, as the cargoes of vessels cannot be discharged except at the distance of a mile or more from the shore, each merchant is under the necessity of building large open boats, as lighters, each of which will carry from one to two hundred boxes of fruit.

While vessels are at anchor, the cargoes of fruit are prepared for them in the following manner. The cabeças of the merchant are directed to assemble their "ranxos," or gangs of assistants, consisting of men and boys. Early in the morning they repair to the workshop of the merchant, where the boxes for fruit are made and kept in constant readiness; each man has a jackass on which he places six or eight boxes, and they proceed to the quinta, often at some miles distance. Having arrived there, the boxes are placed on the grass, and as some hundreds are filled in one day, a number of men return to town for fresh supplies. A large cargo of fruit, if the weather is favourable, is frequently packed, and put on board the vessel, in three days. The boys ascend the trees, with small baskets attached to ropes, while others pick the fruit from the lower branches, or receive the baskets filled by those above, which they empty on the ground and return to them. Every orange or lemon is picked by hand, the boys passing them to each other, in the most careful manner. When a few piles of moderate size have been collected, a part of the gang commence the process of packing. One or more boxes are placed near every pile ; a man sits at each end of the box, with a boy on each side of him. Near the boy is a heap of dry corn leaves which he spreads and hands to the packer, by whom each orange is wrapped in a leaf, and placed in the box ; one hand resting upon it, to secure it till a second is given him. The operation is conducted with great despatch.*

The fruit being packed in the manner described, it only remains for the cooper to put on the cover, and hoop the box, which is then numbered and marked with the initials of the cabeça under whose eye it was packed, and who is accountable should any complaints be made respecting it. A sufficient number of boxes being ready, four or five are placed on the back of each jackass, and are transported to the storehouse in town, where they remain till shipped.

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* The use of corn leaves, in packing the fruit, was introduced by the present American consul, and is found to answer better than paper, which was formerly used. For this purpose, the corn leaves are collected by the peasants immediately after the harvest, when a large heap is seen before almost every cottage, and the women and children are busily employed in separating and drying them. When thoroughly dry, they are protected from moisture, and kept till the next fruit season.

The quantity of fruit annually exported from St. Michael, is estimated at from fifty to sixty thousand boxes. In some very productive years, three thousand boxes of lemons, and eighty thousand boxes of oranges, have been shipped. In addition to this quantity, about forty thousand boxes are supposed to be consumed on the island, including those destroyed by gales of wind and other causes.

The fruit and corn, which are the principal articles of export from St. Michael, have been estimated to give employment to not less than thirty thousand tons of shipping. During the winter of the year 1820, it appears from the record kept by the American vice-consul, that eighty-six vessels were loaded for England, sixty-one of which went to London with 42,586 boxes of fruit. Besides these, there were many vessels belonging to other nations. In the fruit season it is not unusual to see upwards of forty vessels at anchor at the same time, waiting for cargoes.

The orange and lemon trees are propagated by layers. When the branches have taken root, they are separated from the parent stock, and the new trees are transplanted. Many extensive plantations are annually laid out, and the increase of fruit trees has been, of late, very rapid.

In most gardens there are some trees of the Seville, or bitter, orange. Little use is made of this fruit, and only a few boxes are occasionally sent to England and Russia. Large quantities are yearly left to rot on the ground.

A few sweet limes and lemons are produced in the Azores, and are highly prized by the inhabitants, on account of their abundant, mild, and refreshing juice, and peculiar fragrance. They are furnished with a remarkably thick skin, and a small quantity only at a time are ripe enough to pick. A few boxes are occasionally sent abroad as presents, but they do not grow in sufficient abundance to make them an object of trade.

Another variety of lemon and orange is obtained by innoculation of the common or sweet orange, or lemon, with the sour. The fruit produced has a very irregular, lobulated appearance ; and different lobes of the same orange or lemon retain the distinct sweet or sour taste. A tree, covered with fruit of this kind, presents a very singular appearance, some of it being in shape like a cucumber, with numerous long slender processes growing out from the sides; some has a form very similar to the human hand, with projections like fingers; and some hangs in clusters, or resembles large oranges or lemons to which smaller ones of the size of bullets are attached; numerous other forms occur, of which it is difficult to convey an accurate idea by words.

Next to oranges, the grape is the most abundant fruit, and the mode in which it is cultivated is rather singular. The loose fragments of lava, with which the ground is covered and intermixed to the depth of many feet, are removed, and so arranged as to form numerous circular pits, about five feet deep, and from six to eight wide. The bottom of each pit is covered with earth from the decomposed lava, to the height of rather more than a foot, in the centre of which the vine is planted. As the tendrils reach the top of the pits, they spread upon the surface of the rocks. By this method the roots are kept moist, while the vine and fruit, have the full influence of the heat from the direct rays of the sun, as well as of that reflected from the stones underneath. In some gardens the vines are trained over lattice-work, forming verdant covered alleys, but the fruit is far less sweet than when ripened in the other mode.

The principal varieties of the grape, are muscatel, malvazia, bual, preta, branca, alicant, ferral, and verdeilho ; from the last of which the best wine of the island is obtained.

The vintage is towards the end of September. The mode of making wine is very simple, and conducted nearly in the same way as at Madeira. The grapes being cut off the vines, are placed in a large vat, into which three or four labourers enter, and with their naked feet tread the grapes till all of them are broken, and the principal part of the juice is expressed, which is received in a proper vessel. The bruised grapes afterwards undergo heavy pressure, by which, any remaining juice is forced out. The liquor is then transferred to casks, allowed to ferment, and is finally drawn off for use. Although several thousand pipes of wine are made in St. Michael, none is exported ; the quantity being barely sufficient for home consumption.

CHAPTER X.

GEOLOGICAL FEATURES OF ST. MICHAEL—TRACHYTE—ROSTO DE CAO—VOLCANIC TUFF—CHASMS—VARIETIES OF LAVA—PICO DO FOGO—CURRENTS OF LAVA—CRATERS.

The Azores are peculiarly interesting to the geologist, as they exhibit to him at every step marks of their comparatively recent formation, and of the operation of agents the most powerful and terrific. The general appearance of St. Michael has been already noticed; but before describing particular places it may be useful to point out the more prominent geological features in general.

The magnificent mural precipices, which this island presents on every side, afford the greatest facilities for ascertaining the relative position of the rocks composing it. The only considerable exception to this is the beach, the only one of any extent, which stretches along the shore to the eastward of the city, and which is in fact the extremity of the comparatively level central part of the island. The surface of this part is, however, not uniform; it rises here and there into small, isolated hills, or is broken by shallow channels which have been scooped out by torrents from the mountains. These channels are generally dry and have a rocky bottom, but they are occasionally filled with water. Towards the northern extremity of this tract the hills become more numerous, and have a very distinct conical form. Some of them rise to the height of several hundred feet, and are sharply acuminated, while others are truncated at the summit, or more or less deeply excavated. These are succeeded by mountains exceeding a thousand feet in height. A range of mountainous and hilly land is traced, with but slight interruptions, through the centre of the island, from one extremity of it, to the other, having consequently a direction nearly east and west. The high land is not constituted by one entire and unbroken chain, as we see in primitive mountains, but consists of many elevations, a few only of which are connected by their bases. Many of these are truncated cones, and have basin-shaped hollows at their summits, some of which are many miles in circuit and enclose extensive lakes. These, although evidently craters of extinct volcanoes, are of such size as to entitle them to be considered as one variety of valley. The other vallies pursue a course nearly at right angles to the high land, having a direction commonly from north-west to south-east. There are many appearances leading to the belief that they owe their present form, if not their origin, to currents of water, and in most of them small streams are seen at this day. All the rivers and streams flow from the central high land, in opposite directions, to the sea.

The rock, that first presents itself immediately in front of the city of Ponta Delgada, is a lava of a blue colour. It is composed of felspar, and augite, in nearly equal proportions. Innumerable small grains of olivine are dispersed through it, all of which are fresh and have a high degree of lustre. The surface of the rock, where exposed to view, is compact, lumpy and knotted. When broken, the interior is found to have numerous angular cavities varying in size from that of a pin's head, to a quarter or half an inch in depth. These cavities increase in number towards the inferior part of the rock, which there becomes a distinctly porous lava, and specimens taken from the upper surface, and from the lowest part of it, are wholly unlike each other; the one being compact and *basaltic,* the other vesicular and fragile. This rock agrees in many respects with that observed by Sir George Mackenzie in Iceland, and which he considers as a submarine lava.*

The rocks succeeding this on either side have characters so different, that it is highly probable that the lava described is part of a distinct stream. This could not be satisfactorily determined, as the accumulation of large masses and fragments often entirely conceals the stratum on the coast, and it is covered in most other places by the soil, and the buildings of the city. A lava, very similar to the compact portion of this, is, however, found in very evident streams in other parts of the island, and is quarried for architectural purposes. The masses of rock which have been separated from the cliffs, are often many feet in height, and are heaped on each other in such a manner as to render it impossible to proceed along the face of the coast.

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* To account for appearances like the above, Sir George Mackenzie supposes the lava to have flowed originally over the bottom of the ocean—an abundance of steam to have been produced, separating the surface of the lava from the water, as a drop of water is kept detached from a plate of hot iron. The entrance of water into the lava from above was prevented; but at the bottom, the steam, having a constant tendency to ascend, penetrated the lava rendering it porous and vesicular in that part. The more liquid the lava, the greater the ease with which this effect was produced; and in some cases the fluid state of the mass would be sufficient to permit the escape of the vapour altogether, when, aided by the pressure of the superincumbent water, the lava is supposed to have become solid.

Following the road which runs to the east nearly parallel with the shore, at the distance of about three miles from the city, we ascend a small hill, composed of a remarkable breccia, consisting of rounded pebbles and angular fragments of blue, compact lava, scoriæ, and pumice. These substances are united by a high red coloured paste much iron shot. The cement is not cellular, but may be described as consisting of small angulo-granular concretions. The surface of the compound has very much the appearance of the conglomerate so commonly associated with old red sandstone. By exposure to air and moisture, the cement readily disintegrates, falling to the state of a coarse gravel, and the included fragments are set free. The rock is also, now, broken down by the country people, who use it for repairing the roads, and for improving garden walks. It absorbs water with rapidity, and the surface of the road, or walk, on which it is spread, soon becomes dry and hard. In some respects the cement of this rock resembles the products of pseudo volcanoes, the burnt clay of mineralogists. This bed, if such it may be termed, is succeeded to the eastward by a very hard, compact lava, which appears to consist chiefly of augite ; very little felspar being distinguishable. It would probably be considered by some geologists as basalt; it shows, however, no tendency to separate into regular concretions, but forms one uniform mass. Whether the under surface of this bed is slaggy or not, it is impossible to determine, but I was induced to believe that such is the case.

Among the loose masses in the road, and adjacent fields, are many fragments of compact lava with olivine, and of the scoriaceous and other similar varieties. With these are other portions of a red colour, and distinct slaty structure, containing crystals of white felspar, and which evidently belong to the trachyte, or volcanic porphyry, formation.

A few miles eastward of the city of Ponta Delgada is the village of Rosto de Cao,* so called, from a point of land extending a short distance into the sea, which, when viewed from some situations, bears a slight resemblance to the head of a dog. The country houses of some of the citizens are delightfully situated in this village, and the land in the vicinity is better cultivated than in most parts of the island. The point of Rosto de Cao bears every appearance of having been produced by a submarine volcano, and its form is such as would lead most observers to the opinion that it is the remnant of a vast crater. The portion immediately connected with the main island, is so low that at high water it is completely covered, and the more level part is insulated. The lower part is composed of a lava, which, from its scoriaceous character, appears to have been subjected to a more elevated temperature than the lava near the city, and in hand specimens could with difficulty be distinguished from some of the lavas of volcanoes now in activity. The surface of this lava is rough, and abounds in nearly circular depressions like small craters from one to five feet in width. The promontory itself, which is probably more than an hundred feet in height, is composed entirely of a yellowish brown tuff, in which angular pieces of compact and slaggy lava, and trachyte of various colours, are imbedded. The included masses vary in size from that of a pea to that of a man's head, but none of them were found to exhibit any marks of having been subjected to powerful attrition; they were nearly sharp on the edges and angles. The first specimen I struck off, containing an angular fragment, induced me to examine every accessible part of the promontory with attention, as from the general resemblance of the cement of this tuff to that of the tuff of Iceland, I expected to find the imbedded substances rounded, and water-worn. The tuff does not form one solid mass, but is divided into very distinct strata from one to four feet thick, resting on each other, and dipping uniformly towards the main island. The sea has worn away the edges of the strata, and produced considerable excavations in some places; while in others, fissures about a foot in width cut across them, and are open down to the surface of the water. Numerous veins cross the strata, and are rarely more than four inches wide; they are composed of a hard, compact rock, resembling some greenstones, the colour of which has been changed to brown from the decomposition of iron pyrites. In some of the veins, the rock is in small distinct prismatic concretions, arranged horizontally.*

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* Face of a dog.

From the point just described the shore has a regular curve for some distance, and is in part covered by a fine, light sand, forming the principal beach on the island. The sand is composed of comminuted pumice, and lava, with a large proportion of augite and olivine in fine powder. It is often blown into heaps by the wind; and a fort, erected on the beach, has been nearly covered by it.

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* These veins are very numerous in some parts of this tuff, and intersect each other in every direction, giving to the surface an appearance similar to that observed in the greenstone and graphite of the harbour of Saltcoats in Scotland.

At the eastern extremity of this beach the lava presents many interesting appearances. It passes out from under the soil, and continues to the sea, till finally lost beneath it. Much of it is, however, always many feet above the level of the highest tides. The surface is rugged, and appears to have been heaved up into large bubbles, some of which seem to have burst open, while others remained entire. In some parts, it has the appearance of waves, from four to ten feet in length, and of variable height, but rarely exceeding five feet. On the surface of the more horizontal parts of this lava, innumerable small circular craters are observed. Their diameter is seldom more than three feet, and their depth is from one to two. The structure of the lava is vesicular, and it has a reddish brown colour. There is one circumstance observable in this, and many other parts of the coast of St. Michael, which is rather opposed to the opinion that lavas with a rugged surface have always flowed in the open air. It is the occurrence of lava with this character in the immediate vicinity of the sea, and never at a great distance from it. Where it can be traced from the water's edge, the structure uniformly becomes more compact, and the lava presents a smoother surface as it recedes from the sea.

Almost in a direct line from this body of lava, and about a mile north of the village of Rosto de Cao, is a vast chasm in the rocks; being open to day, it displays their structure with great advantage. As the sides are perfectly perpendicular it is impracticable to descend without ropes or ladders, and not having anticipated any thing of the kind, I was not prepared with these necessary aids and was obliged to content myself with a view of the interior from above. Innumerable large masses, probably of basalt, are seen piled upon each other at the bottom, in the most confused manner. It is highly probable that this was once a cavern, the roof having been broken down by some violent convulsion of nature. The sides are, at present, about fifty yards apart, and the length of the chasm is not less than one hundred yards, its depth probably exceeds seventy feet. A short distance beyond this, is another chasm of nearly the same size, into which it is not difficult to descend at one extremity, where a quantity of loose stones and soil has formed a gentle slope. The sides of this opening are more irregular than those of the first. The lava, being broken into angular masses, which project and rest upon each other, affords a striking example of the arrangement, whence trap rocks have received their name. Two varieties of rock are distinctly seen forming the sides of the second chasm; one of them is basalt of a blackish blue colour, with a compact structure, and is divided into imperfect columnar masses, between some of which, towards the upper par't are thin layers of a brown tuff. In some places this tuff is confusedly intermixed with lava, having a coarse fibrous aspect. Among the loose masses at the bottom are pieces of a black colour, exhibiting the same structure, many of which have a cylindrical form, differing from any other varieties of lava noticed on the island. When broken across they are found to consist of a porous and compact portion, the latter forming a crust about a quarter of an inch in thickness, which completely envelopes the former.*

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* Since writing the above, I have received from my friend Dr. Trail, of Liverpool, a specimen of lava from Iceland, which very much resembles this. It was broken by Mr. Gladstone, from a mass "half way up Heckla, rising through the surface in an arborescent form."

One of the most conspicuous hills in this vicinity, and at the same time one of the most perfectly defined cones on the island, is "Pico do Fogo," or peak of fire, so called from the aspect of the rocks composing it. It rises with great regularity of outline from the centre of the narrowest part of the island, to the height of six hundred and forty seven feet, as was ascertained by barometrical observations. The base of Pico do Fogo is strewed with spongy scoriæ of a deep red colour, intermixed with variously shaped masses of a compact, fine-grained, basaltic lava, containing highly transparent crystals of greenish olivine, and black crystals of augite. On the eastern side of the cone, there appears to have been a large opening, now partially filled up with scoriæ and fragments of lava; but which evinces by its irregular form, the rents and fissures, which can be traced from it through a considerable part of the hill, and its burnt and partially vitrified sides, that it must have given egress to a body of lava, which now, hardened and compact, is traced for some distance beyond. The huge fragments strewed around, and the large masses standing erect amid this stream of lava, or irregularly piled on each other, suggest many interesting ideas with regard to the mode, in which the phenomena may be conceived to have taken place. Many of the masses fixed in the lava can with difficulty be distinguished from basalt; they exhibit no vesicular cavities, and are sometimes so hard and fine grained, as to approach, in external characters, to clinkstone. Now and then these masses contain crystals of felspar, possessing a high lustre and pearly white colour, forming a beautiful porphyry.

The ascent to the summit of Pico do Fogo is somewhat fatiguing on account of the slight coherence of the surface, and the steepness of the acclivity. The sides of this, and of most other hills on the island, are partially covered by the common heath, (*erica vulgaris*) almost the only plant which thrives upon any of the hills, except in moist and shaded situations, where, the ferns are remarkably luxuriant and abundant. The summit of the hill is composed of small fragments of pumice, intermixed with ashes, and is nearly destitute of vegetation. Two varieties of helix, viz. the *planorbis* and *nemoralis*, are found here in abundance.

The present appearance of Pico do Fogo is so regular and beautiful, that it is difficult, at first sight, to attribute its origin to volcanic agency. It is probable that the strata at the bottom of the ocean were softened, but not wholly melted, under powerful compression, and this is strongly indicated by the structure of much of the lava at the base of the hill. The softened strata must have been gradually elevated by the expansive force from below, till an outlet or crater was produced at the superior point, permitting the escape of those substances, which had been brought into a state of more perfect fusion, and which, on cooling, assumed the forms of pumice, scoriæ and ashes ; substances ejected last by all volcanoes. The larger and heavier masses rolling down the acclivities would accumulate at the bottom, and many of them remain firmly fixed, or wholly enveloped in the lava as they are now seen ; while the lighter substances, rising in nearly a perpendicular direction, which they would have acquired during their passage through the inverted hollow cone, would fall back upon the crater and so arrange themselves as to round off the inequalities and render the outline more perfect. Subsequent decomposition, from the influence of air and moisture, would insensibly but effectually aid in rendering the whole surface smooth and regular as it now appears. The lateral eruptions, the effects of which are visible on the eastern side of Pico do Fogo, doubtless occurred subsequently to the first eruption from the sea.

From the summit of Pico do Fogo we can trace with the naked eye, the course of a few uninterrupted streams of lava, spreading out and uniting towards the north. Other currents, or perhaps detached portions of the same, are distinguished as black and barren spots entirely destitute of vegetation, and are strongly contrasted with the land which is under cultivation; but they cannot be traced in a clear and satisfactory manner to the craters whence they flowed. The lava is also frequently hidden by the heaths and other shrubs, and sometimes by fields of corn, growing on those parts of the surface where more rapid decomposition has produced a fertile soil.

Near Pico do Fogo is another hill, very similar to that in its structure and general appearance, but the summit is truncated, and basin-shaped, exhibiting the most decisive marks of its having been a crater. Many of the small hills in the vicinity, are likewise excavated at their summits, or exhibit traces of lateral eruptions. The sides of some of these ancient craters are irregularly broken in, while those of others remain entire, and nearly circular, though now covered, without and within, by heaths and low shrubs. The walls of most of the latter, shelve down gradually from their lips, and meet in the form of inverted cones, sometimes terminated by planes of greater or less extent at the bottom. The depth of these craters varies from ten to fifty, and even a hundred feet.

CHAPTER XI.

EXCURSION TO THE CAVERNS—CAVERNOUS LAVA—CAVERNS—STALACTITICAL LAVA—IMITATIVE LAVA.

Being informed by persons residing in St. Michael, that there were extensive caverns in the vicinity of Ponta Delgada, I became anxious to see them. Having hired, as a guide, a countryman, who had visited them, an excursion was undertaken in company with some gentlemen of the island. Torches, and whatever we supposed might aid us in our examination, were provided, and mounting our donkeys we left the city. Although no one of our party, except the guide, had seen these caverns, I found that it was a very general opinion among the islanders, that they existed, and were even continued with more or less interruption to the western coast of

Portugal.* Whatever may be the fact in regard to their extent, we soon became satisfied of their existence.

This excursion was made early in the month of April, when the corn was rather more than a foot in height, and the oranges were hanging on the trees in a state of great maturity. A short distance from the city we passed the country houses of some Morgados; all of them are built of stone, and surrounded by lofty stone walls, with heavy gates surmounted by the massive ornaments of Moorish architecture. Contiguous to each house is an extensive granary, likewise built of stone, through the grated windows of which large quantities of corn, of the past year, were seen. When we approached one of these buildings three or four half-starved, savage-looking dogs made their appearance on the walls, barking and growling with great ferocity.†

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* This opinion is not peculiar to the Azoreans, but has been maintained by some late writers, and rests principally on the fact that earthquakes have been felt in both places at the same time.

† There is scarcely a man on the island, who has not a dog, and many have half a dozen. It is a remarkable fact that, although these animals are so numerous, no instance of hydrophobia was ever known among them.

In the course of our ride we now and then crossed what appeared to be portions of currents of lava, which rendered the roads, in some places, excessively rugged. These were, however, soon lost beneath the soil, and could not be traced to any considerable distance. Where their surface was not covered it abounded in rounded protuberances, precisely such as would have been produced by the elevation of large blisters, from one to four feet in diameter, while the rock was in a state of imperfect fusion. Most of these were unbroken, but others appeared to have burst open, or to have been subsequently broken down. Those which were entire, returned a hollow sound when struck with the hammer. The interior of many, which were open, was found highly vesicular and porous, while externally they appeared much less so, and indeed sometimes quite compact. Their sides were rarely more than three inches thick. The greatest inequality of the under surface of some of them was produced by elongated portions of the lava, in the form of stalactites, which varied from one, to five or six inches in length, and, in a few instances were continued quite across the cavity, being attached at both extremities. This lava appears very similar to the variety in Iceland, to which Sir George Mackenzie has aptly applied the term cavernous.

In some places the vesicular lava graduated into a much finer grained variety, compact and hard, having all the characters of well defined basalt; olivine was disseminated through it in small crystalline grains with a highly vitreous lustre, and free from any appearance of disintegration. Although this mineral is found in most of the lava of the island, the grains are small, rarely exceeding the size of a common pea. I found one specimen only, the diameter of which was nearly half an inch, and this was divided by slender elongated portions of lava continued from the mass, in which the olivine was imbedded. The colour of the mineral was usually olive green. Aware of the readiness with which olivine undergoes decomposition, I examined the lava of this vicinity, as well as that of other parts of the island, with great attention to this circumstance, but always found it fresh and unaltered. I also examined the form of the cells, or spaces in the rocks, but none of them corresponded with that of the grains of olivine. The vesicular structure of the rock was therefore not to be attributed to the decomposition, or falling out of the grains of this, or of any other mineral.

In that part of the lava which bore the greatest resemblance to basalt, I found a few grains of haüyne, (*latialite* of Haüy,) well characterised by their sky-blue colour, and other external characters.* Loose masses of scoriæ, and of other varieties of lava, occasionally broke through the soil in the road and fields over which we passed, but no appearances, differing from those already noticed, were observed in them. The soil itself appeared rich and of good depth.

Having reached a field between three and four miles north-west from the city, we discovered the entrance to the caverns. It is a fissure in the rocks, which here rise a few feet only from the surface, and is about wide enough to admit two persons abreast. The bottom, when viewed from the entrance, for some yards formed a gently inclined plane, but as we proceeded the rocks spread out on both sides, and we soon found ourselves in a spacious apartment, the floor of which was heaped with huge fragments of lava that had fallen from above, and over which our progress was for some distance difficult and rather dangerous. At the distance of ten or twelve yards from the entrance, we came suddenly upon the edge of a precipice, beyond which it seemed impossible to proceed. Creeping, however, with caution along the edge, we presently came to a point where an accumulation of fragments afforded a natural, but dangerous, passage, and, by leaping from rock to rock, we at length reached the bottom.

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* These specimens are precisely like those from Andernach.

The height of the precipice was probably not less than thirty feet; and as the torches, with which we were armed, served to illuminate the cavern but feebly, we directed our guide to kindle a fire. From the sound of our voices, we were of opinion that this apartment was of great extent, and the strongest light we could obtain, did not enable us to discern the roof.

The light of the fire strongly contrasted with, and gradually lost in the surrounding darkness, produced a very picturesque effect, which was greatly heightened by the situation of our party, some of whom were obscurely seen standing upon the huge fragments of rock, while others were passing and repassing in various directions, exploring a passage to the recesses of the cavern. Having groped about for some time, over and among rocks of all sizes and shapes, which were piled on each other in every possible manner, we at length discovered, on our right, a chasm about two feet in width. Looking into it from above, the space below appeared to enlarge, and the lava on which we stood to form the roof of another cavern beneath us. On the other side of the chasm, the lava, not more than a foot in thickness, was distinctly seen projecting over, unsupported, except by its connection with the lava beyond. The cavern in which we were, was continued beyond this chasm, and stones when thrown with great force, were heard to fall at a very considerable distance from us. But as that part of the lava, which projected over the chasm was so thin it was deemed most prudent not to cross it, and we retraced our steps.

The lava in this place had a much more vesicular, spongy, and scorified aspect, than at the entrance of the cavern; its colour varied from a reddish brown to black. On examining the specimens brought away, they were found covered with small protuberances, and a thin yellowish white crust of pearl sinter. A quantity of the earth, derived probably from the decomposed lava, and which in part covered the floor of the cavern, when examined with the microscope, was found to contain innumerable grains of olivine, and augite. The lava forming the walls, was coated in some places with a calcareous substance, which was subsequently found to effervesce with acids, and to be agaric mineral, (*Chaux carbonatée spongieuse* of Haüy); it was doubtless derived from infiltration, yet there are no calcareous rocks on the island, nor did I find carbonate of lime any where contained in the lava. Returning to the foot of the precipice, we proceeded from it, in a direction contrary to the last. Descending a few feet we found ourselves in another spacious apartment. The width, soon after entering it, was estimated to be not less than forty yards, the height we could not determine, but as we advanced, the walls, and roof approached nearer to each other, till, at the distance of about an hundred yards from the widest part, we were unable to stand upright, and the cavern soon terminated a short distance beyond, in an acute angle.

The floor was covered with fragments of every size, and from the roof, hung stalactites of lava; an appearance highly interesting, and which amply repaid me for the danger and difficulty encountered. On breaking the stalactites, they were found to be much more porous and vesicular than any lava I had previously seen. The cells were nearly perfect spheres arranged in concentric circles, and most of them were large enough to contain a pea. They were not visible, however, till the stalactites were broken, being covered with a smooth, and hard crust. The partitions between the cells were less than the sixteenth of an inch in thickness, and had an imperfect glimmering lustre on the fresh fracture. Most of them contained a loose, brown, earthy matter, probably the result of partial decomposition. The stalactites, externally, have a dark iron grey colour, sometimes passing to black, and they are deeply channelled in a longitudinal direction. They occur of all sizes, some of them are less than an inch in length, while others exceed a foot. Their diameter is not less variable, but never exceeds six inches at the thickest part. Those which were about a foot in length, were usually from one to three inches thick. They do not exhibit much variety of form, being, for the most part, straight, and detached; but now and then two of them are connected laterally for about one half their length, when they diverge, each suddenly tapering to a sharp point.

Although the walls and floor of this cavern, and the exterior of the stalactites, were perfectly dry, yet whenever the latter were broken a few drops of water fell from them; having been condensed probably in the cells, the interior surfaces of which were always found moist when first exposed.*

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* Late experiments have shown the great attraction trap rocks evince for moisture, but this is much more perceptible in the lava of St. Michael, whence probably the uncom-

The difficulty of penetrating to the last apartment of the cavern, was by no means inconsiderable, and for the last few yards we were obliged to creep upon the bottom, and advance with the utmost caution, while the sharp points of hundreds of stalactites were in contact with our clothes. Where the roof and floor approached to within a foot or two of each other at the extremity of the cavern, we could distinguish the stalactites reaching from the one to the other; but no where else was there any similar appearance.

The masses collected upon the floor, in many parts of the caverns, were angular blocks, and had evidently fallen from above; portions of stalactites still adhering to some of them. Judging from these, the upper part of the rock in which the caverns are situated, is a fine grained lava, not wholly devoid of cells, which are scattered here and there throught it. It is composed of augite, felspar, and a little basaltic hornblende; the first is by far the most abundant. Some grains of olivine were also contained in it. The cells became more numerous towards the under, or stalactitical sur-

mon fertility of the soil derived from it. Some of the specimens from the caverns, after exposure in my cabinet to a dry atmosphere, were packed in papers for a few months, and on reopening them they were found quite moist.

face, and the last two or three inches were so full of them that the rock in some parts had the appearance of honeycomb.

The most remarkable, and not less interesting circumstance in the lava of these caverns, and one which throws much light on the manner in which they may have been formed, is an appearance on the surface of many masses, very similar to what would be produced on lead thrown, when in a state of fusion, into water. This is beautifully displayed on the sides of the cavern last described, where the lava has assumed a great variety of imitative forms. In many places the walls seem to be covered with petrifactions of vegetables, and shrubs, retaining the most perfect resemblance to their originals. I broke off many specimens which would be taken at first sight for bunches of grapes partially flattened, while many more could with equal readiness, be likened to other common fruits. The surfaces of the protuberances are about equal in smoothness to that of unglazed porcelain, and the colour inclines to purple. Where the lava had not assumed these appearances, it presented a waved and fluted surface, or resembled some architectural ornaments.

A few feet from the bottom, and extending some yards along the sides of the caverns, is a shelf of lava, less than an inch in thickness, projecting one or two feet, horizontally, from the sides. Its upper surface, is slightly irregular and waved; and the depressions and elevations have a direction, for the most part, parallel to its edge. This surface feels smooth, and no vesicles can be observed in it. The lower surface is very irregular, being covered with ovoidal prominences from the size of a small pea, to that of a large grape, each one being attached by a slender stalk. These are arranged, sometimes with great regularity, in ridges, running from the outer edge of the shelf to the side of the cavern. As the prominent parts are continued to the outer edge, they there intersect each other, forming a coarse net-work in some places, however, it is much finer and appears, at a little distance, like fringe. From these appearances it is impossible to avoid the inference, that this extensive body of lava has been in fusion beneath the waters of the ocean. Whether it flowed as a current, or was merely softened in its original situation, and was in that state elevated to its present level by the expansion of an elastic fluid, are interesting subjects of inquiry to the speculative geologist.

There are many appearances indicating the existence of other caverns in this island; but it is not probable that all of them have been produced by volcanic agency alone. From the structure of many parts of the coast, the arrangement of the beds, and the materials of which some of them are composed, there can be no doubt that other causes have had great influence in forming extensive excavations. Comparatively thin beds of all the varieties of lava are seen along the shore, which are separated from each other by beds composed of pumice, tuff and ashes, often forty or fifty feet thick. As the latter are easily broken down, they have been partially removed by the sea, or more completely by the resistless force of earthquakes, while the lava remains entire, sometimes forming natural arched bridges. In this manner some caverns may have been produced, or others, which were previously closed, have been laid open.

CHAPTER XII.

GEOLOGY OF ST. MICHAEL CONTINUED—ERUPTIONS FROM THE SEA.

Proceeding from the city towards the north-west, the road gradually becomes more elevated, and, at the distance of a few miles, is not far from an hundred feet above the level of the sea. The coast is then perpendicular, and preserves its precipitous form, with but few interruptions, to the western extremity of the island. For the first mile or two, the road is tolerably smooth, and of good width, but soon after becomes rough, and in many places is rendered almost impassible by the projecting masses of lava. It is also highly dangerous from its vicinity to the edge of the precipices, or of narrow and deep ravines.

The bluish compact lava continues from the city a short distance in this direction, but is presently succeeded by a rock of a brownish colour, resembling the cellular basalt of Steinau. The cavities in it are irregular, but do not appear to have resulted from the decomposition of the rock, or of any minerals it once contained. This basaltic rock was evidently at one time covered by tuff, and is indeed now concealed by it in some places. Passing over large patches of both, I found many masses of cellular and slaggy lava, some of which envelope hornblende, felspar, augite and olivine. There are appearances of alternations of the basaltic rock with tuff, but they are soon lost beneath the vast body of pumice that extends, with little interruption, to the extremity of the island.

Where the tuff has yielded to the action of the waves of the sea, to which it is exposed, many small coves have been formed; or portions of the island have been separated which yet appear above water. Here and there, on the face of the precipices, compact lava is seen in very regular strata, two or three feet only in thickness, and their under surfaces are often slaggy. They are frequently arched, and immediately suggest to the observer the idea that some powerful force must have been applied to them from below while they were in a viscid, yielding state.

Fewer large masses are contained in the tuff of this part of the coast, than in that of some other places already noticed; and it seems to consist almost wholly of comminuted pumice. Its colour is dark yellowish grey. The tuff and other beds succeed each other with great irregularity along the whole extent of coast, lava constituting the superior stratum in one part, and tuff in another. The precipice continuing below the level of the water, it was impossible to ascertain the nature of the lowest stratum, but, as far as could be seen, the same irregularity was observed.

Among the loose masses of lava near the Pico das Camarinhas, I found one specimen of considerable interest. It is a piece of common quartz, which has been converted into a perfect enamel; the prevailing colour is white, but it is crossed by parallel reddish-yellow lines, giving to the specimen somewhat of a slaty character. This fragment is sharp-angled; it is about three inches in length, and from one to two inches thick. It has evidently been exposed to intense heat, having internally a semi-vitrified appearance, while the exterior has a vitrified transparent crust, the sixteenth of an inch in thickness. Through this glassy coating the reddish-yellow lines are distinctly visible, but they are not continued into it. This is the only specimen of the kind I found on the island.

The Pico das Camarinhas and its vicinity are highly interesting from the recent submarine eruptions, which have taken place near it. As every circumstance, connected with these terrific events, is important to geologists, and as different impressions were produced at the time on the minds of different spectators, I have endeavoured to collect all the information they were able to impart, and to connect it with the published accounts, that as complete an idea as possible of the attending phenomena may be obtained.

From the accounts which I have received from many, who saw the first eruption, it appears, that in the months of July and August, 1810, the island of St. Michael was convulsed by repeated earthquakes. Slight shocks were also occasionally noticed till January, 1811, on the last day of which month, about one o'clock in the morning, a shock, far more powerful and terrific than any which had preceded, was experienced; to this others succeeded, and they were repeated during the day in such rapid succession, that, in the city of Ponta Delgada, thirty-one were counted in the space of a few hours. On the following day, a strong sulphureous smell confirmed the report that fire and smoke had issued from the sea opposite to the small village of Ginettes, at the distance of about two miles from the shore.*

The wind, blowing from the westward, carried clouds of fine ashes towards the city, a distance of eighteen miles, where it was deposited upon the buildings and other objects. The column, formed by the erupted matter and smoke, was seen by persons many miles farther to the eastward, rising above the intervening hills. Some of the pieces of lava were projected to the height of more than two thousand feet. When first seen above water they were black, but, as they emerged from the column, became red and glowing. Vast quantities of smoke, ashes, and water were ejected to the height of some hundred feet, but never rose so high as the stony masses. This eruption continued eight days, when it gradually diminished in activity, and finally ceased altogether, "leaving a shoal on which the sea broke." The weather during this time was stormy, and the wind at southwest.†

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* See Map 2.

† Extract of a letter from Thomas Hickling, Esq. American Vice-Consul at St. Michael, dated Ponta Delgada, Feb. 1811.

"On the 29th, 30th, and 31st ultimo, we were much alarmed by frequent shocks of earthquakes, perhaps upwards of twenty, and on the 1st. instant, information was received here, that a volcano had broken out in the sea, six

On the thirteenth of June following, a sulphureous smell, attended with repeated and violent earthquakes, announced that an eruption had again taken place, which was soon confirmed by the peasants from the western part of the island. The spot, whence the flames and ashes now issued, was about two and a half miles to the westward of that where the first eruption occurred, and at the distance of a mile from the shore, opposite the mountain called Pico das Camarinhas. The wind blowing off shore, carried away the smoke, and allowed a perfect view of this grand phenomenon,

leagues west of this port, and about half a league from land, in fifty or sixty, and some fishermen say, in seventy to eighty fathoms water. I repaired immediately to that part of the island, and to my utter astonishment saw a vast column of black smoke issuing out of the ocean. The wind was a gale from the southward, and blew the smoke over the land. The sea was excessively agitated, and the surf on the shore was frightful.

I was assured by the peasants, that, on the preceding night, fire had been emitted, and, being curious to ascertain the fact, I returned to the city, and desired my son and son-in-law to go and remain opposite to the volcano all night—they did so, and saw, at various times during the night, fire issue forth, like a number of rockets discharged together. Large masses of stone, or lava, were continually thrown up above the surface of the sea. In eight days it entirely subsided, leaving a shoal on which the sea broke."

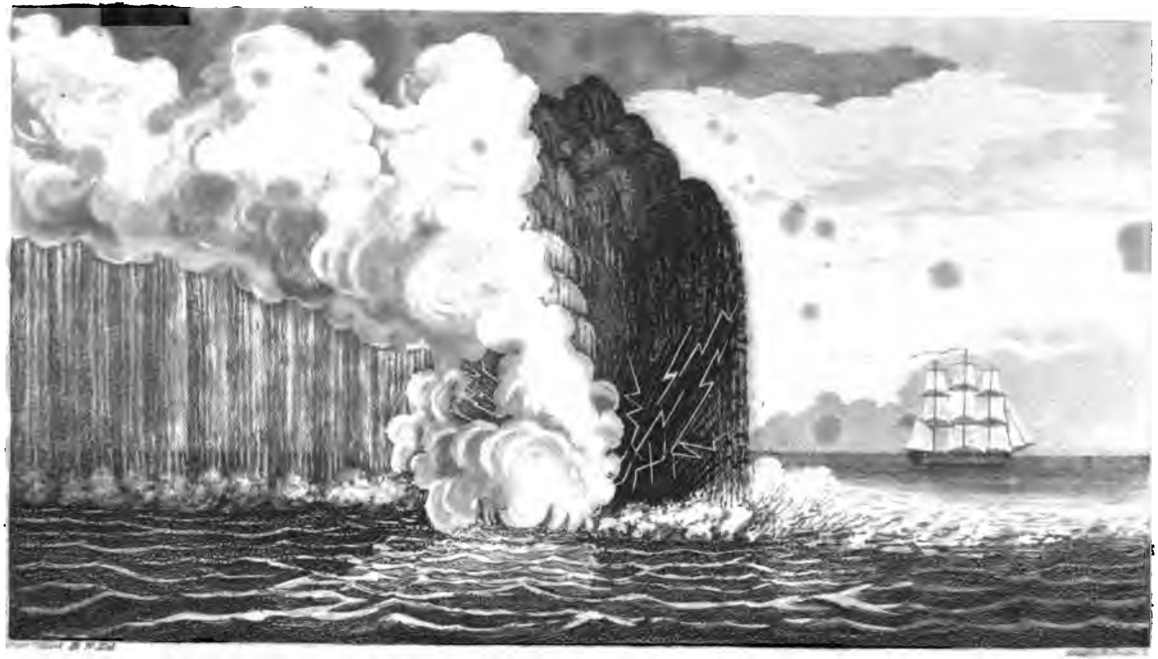
from the higher land The ground is described as having been in a state of tremulous motion, more or less violent as the eruptions were more or less powerful.

On the seventeenth the ejected matter became more abundant, and the volcano appeared in its highest degree of grandeur, forming a vast column, apparently of smoke and ashes; the eruptions were repeated in rapid succession, but with very regular intermissions. This latter circumstance encouraged some gentlemen, to go off in a small vessel, with the intention of sailing round the column; they were, however, unable to accomplish it, for scarcely had they set sail before they became enveloped in a dense, black cloud, from which poured down heavy showers of salt water and ashes, covering the deck of the vessel to the depth of more than an inch. The substances, thrown from the volcano, rose to the height of many hundred feet in one body, which then expanded and rolled away in heavy clouds, and through it, vivid flashes of lightning appeared in every direction. This column consisted of smoke, ashes, and water; at intervals considerable quantities of red hot stones were projected from it.

The eruption having ceased, a small island was discovered to have been formed, which was estimated by those persons who observed it from the shore of St. Michael, to be about a mile in circumference, and between two and three hundred feet above the surrounding water. After this it gradually increased. The north-eastern extremity of the new island had a conical form; and on the other side was a deep hollow, or crater, into which the tide flowed, and from which flame rose for some days, attended with incessant explosions. The surf was too high at this time, to allow any person to land, but, from as near inspection as possible, the whole island appeared to consist of fine black ashes; very few large stones could be seen. The earthquakes now ceased, and the whole island soon after disappeared.

The first account of this eruption was published in the Philosophical Transactions for 1812, by Captain Tillard of the British frigate Sabrina. As the vessel approached the island of St. Michael, on the 12th of June, 1811, smoke was observed on the surface of the sea. Captain Tillard landed at Ponta Delgada, and on the 14th rode to the north-western part of St. Michael, and viewed the volcano from the edge of a cliff.

"It was only a short mile," he continues, "from the base of the cliff, which was nearly perpendicular, and formed the margin of the sea; this cliff being from three to four hundred feet high. Imagine, an immense body of smoke, rising from the sea, the surface of which was marked by the silvery rippling of the waves, occasioned by the light and steady breezes, incident to those climates in summer. In a quiescent state, it had the appearance of a circular cloud, revolving on the water like an horizontal wheel, in various and irregular involutions, expanding itself gradually on the lee side; when suddenly a column of the blackest cinders, ashes, and stones would shoot up, in form of a spire, at an angle from 10° to 20° from a perpendicular line; the angle of inclination being universally to windward; this was rapidly succeeded by a second, third, and fourth; each acquiring greater velocity and overtopping the other, till they had attained an altitude as much above the level of our eye as the sea was below it. As the impetus with which the columns were severally propelled, diminished, and their ascending motion had nearly ceased, they broke into various branches, resembling pines, then again forming themselves into festoons of white feathery smoke, in the most fanciful manner imaginable, intermixed with the finest particles of falling ashes, which at one time, assumed the appearance of innumerable plumes of black and white ostrich feathers, surmounting each other; at another, that of the light wavy branches of a weeping willow. During these bursts, the most vivid flashes of lightning continually issued from the densest part of the volcano, and the cloud of smoke, now ascending to an altitude much above the highest point to which the ashes were projected, rolled off in large masses of fleecy clouds, gradually expanding themselves before the wind in a direction nearly horizontal, and drawing up to them a quantity of water-spouts, which formed



View of the Eruption off the N. W. Coast of the Island of St. Michael. June 13th 1811.

a most beautiful and striking addition to the general appearances of the scene. That part of the sea, where the volcano was situated, was upwards of thirty fathoms deep, and, at the time of our viewing it, the volcano was only four days old.

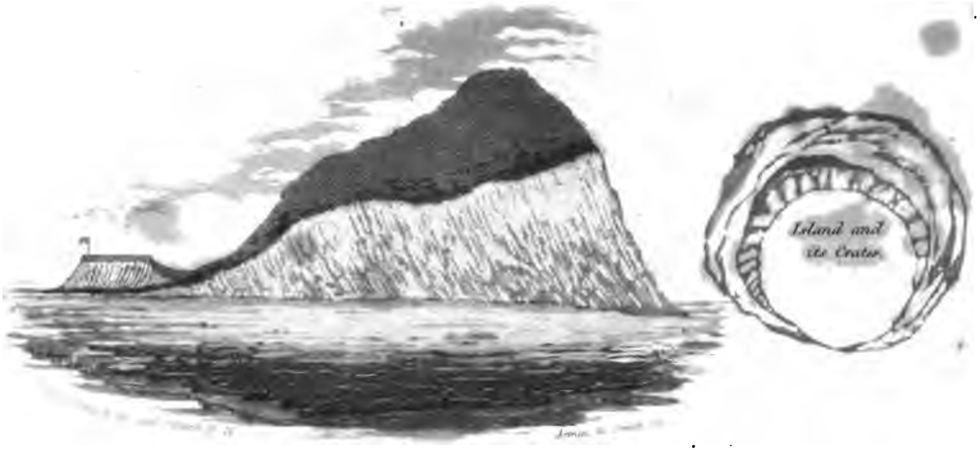
Soon after our arrival on the cliff, a peasant observed he could discover a peak above the water; we looked but could not see it; however, in less than an hour, it was plainly visible, and before we quitted the place, which was about three hours from the time of our arrival, a complete crater was formed above the water, not less than twenty feet high on the side where the greatest quantity of ashes fell; the diameter of the crater being apparently about four or five hundred feet.

The great eruptions were generally attended with a noise, like the continued firing of cannon and musquetry intermixed, as also with slight shocks of earthquakes, several of which having been felt by my companions, but none by myself, I had become half sceptical, and thought their opinion arose merely from the force of imagination; but while we were sitting within five or six yards of the edge of the cliff, partaking of a slight repast which had been brought with us, and were all busily engaged, one of the most magnificent bursts took place which we had yet witnessed, accompanied by a very severe shock of an earthquake. The instantaneous and involuntary movement of each, was to spring upon his feet, and I said, "this admits of no doubt." The words had scarce passed my lips, before we observed a large portion of the face of the cliff, about fifty yards on our left, falling, which it did with a violent crash."

On the succeeding day Capt. Tillard, in company with the British Consul and some friends, proceeded with the ship towards the volcano, with the hope of obtaining a night view, but were disappointed, from the state of the weather and the abated activity of the volcano.

" At this time," he proceeds, " it seldom emitted any lightning, but occasionally as much flame, as may be seen to issue from the top of a glass house, or foundery chimney. On passing directly under the great cloud of smoke, about three or four miles distant from the volcano, the decks of the ship were covered with fine black ashes, which fell intermixed with small rain.

On the fourth of July, I was obliged to pass with the ship very close to the island, which was now completely formed by the volcano, being about eighty yards above the sea. At this time it was perfectly tranquil, which circumstance determined me to land and explore it more narrowly. As we approached, we perceived that it was still smoking in many parts. We found a narrow beach of black ashes, rom which the side of the island rose, in general, too steep to admit of our ascending; and where we could have clambered up, the mass of matter was much too hot to allow our proceeding more than a few yards in the ascent. The declivity below the surface of the sea, was equally steep, having seven fathoms water scarce the boat's length from the shore; and at the distance of twenty or thirty yards we sounded twenty-five fathoms. From walking round it in about twelve minutes, I should judge that it was something less than a mile in circumference; but the most extraordinary



Appearance of the Island Sabrina bearing S.W. one mile from St. Michael.

part was the crater, the mouth of which, on the side facing St. Michael, was nearly level with the sea. It was filled with water, at that time boiling, and was emptying itself into the sea by a small stream about six yards over, and by which I should suppose it was continually filled again at high water. This stream close to the edge of the sea, was so hot as only to admit the finger to be dipped suddenly in and taken out again immediately."

From the appearances on this side it seemed probable that the sea had made a breach in two places. Within the crater, Captain Tillard found "the complete skeleton of a guard fish, the bones of which, being perfectly burnt, fell to pieces upon attempting to take them up, and by the account of the inhabitants on the coast of St. Michael, great numbers of fish had been destroyed during the early part of the eruption, as large quantities, probably suffocated or poisoned, were occasionally found drifted into the small inlets or bays. The island is composed principally of porous substances, and generally burnt to complete cinders, with occasional masses of stone."

The following is an extract of a letter from a gentleman in the Azores, lately published in the ninth volume of the Journal of Science and the Arts, of the Royal Institution of Great-Britain.

"On Thursday morning, the 13th of June, 1811, at about half past one o'clock, a strong shock of an earthquake was felt at the city of Ponta Delgada, and for nearly eight hours the shocks continued with more or less violence, with intervals of from fifteen to twenty minutes between each shock, and more particularly at the west end of the island, where a number of cottages were thrown down, and other more substantial buildings considerably injured. On Friday morning a submarine volcano burst forth, about a mile from the shore, to the N. N. W. half W. of the Pico das Camarinhas, which threw up stones and sand to a considerable height, but it subsided in the afternoon of the same day. On Saturday, the 15th, the volcano burst forth again in the same place, though not with so much violence; the shocks of the earthquakes were also more mild, but considerable damage had already been done in the districts of Ginettes, Varzea, Mosteiros.

On Sunday morning early, accompanied by some friends, I rode to the west end of the island to observe this phenomenon, and was much gratified at seeing one of the most awful and sublime spectacles that nature can present to human observation. I took my station on the brink of a steep precipice, impending over the sea shore, at the nearest possible distance from the volcano, which was raging with immense fury, throwing up stones and sand to a height of upwards of a thousand feet above the level of the sea, attended with a hollow thundering noise, like a distant cannonade, and accompanied with some smart shocks of earthquakes. The mephitic vapour was at times so strong, as to affect the breathing, even to danger of suffocation, as the wind blew direct on shore from the N. N. W. The sea was agitated around the volcano, to a considerable distance, and boiling like an immense cauldron, the diameter of which appeared to be about five hundred feet; the stones (some of which were apparently above a ton weight,) being thrown up nearly perpendicular, several hundred yards, fell with tremendous noise in every direction about the volcano, and kept the sea in a continual foam. The appearance of the clouds, rising in a spiral form, and spreading several leagues to the southward, attracted particular notice, from the water-spouts which formed from the black denser clouds, and drew up the water in a variety of directions. At one time I counted eleven water-spouts in full action; occasionally the clouds burst over us with light rain, charged with ashes and small scoriæ, drawn up from the volcano; the smell of sulphur was so strong as greatly to incommode the inhabitants of Ponta Delgada, a distance of nearly twenty miles.

On Tuesday, the 18th of June, I returned to the same spot, accompanied by Captain Tillard, of his majesty's ship Sabrina, Mr. Nicholes, purser of that ship, and a Portuguese gentleman, and on our arrival at half past ten, we discovered the mouth of a crater, several feet above the surface of the sea; the quantity of sand and ashes, thrown up from the centre of the crater, formed an embankment as it fell, which kept out the sea, except in one place, where an *embouchure* of about thirty feet wide was discernable; the sea rushed into this part with incredible fury at every interval of the eruption, which subsided only for a few minutes, returning with redoubled force; in less than three hours the crater had increased in height above the level of the sea nearly sixty feet; having a pocket-compass, we took the bearings of the volcano, and, having measured a base line of eight hundred feet, we found the distance from the spot of observation to be five thousand one hundred feet, or nearly an English mile. About one, P. M. a most tremendous explosion took place, which lasted nearly twenty minutes, and darkened the atmosphere for several miles around; the flashes of lightning were very vivid, and produced a grand effect on the black dense smoke of the volcano ; the rocks thrown up were red hot, and caused a hissing noise on falling into the sea, which was distinctly heard at intervals, when the subterraneous thunder ceased : part of the cliff, on whose banks we were seated, fell into the sea, from the shock of an earthquake, and obliged us to make a precipitate retreat for fear of a repetition. At five o'clock we quitted this awful scene with reluctance ; nothing could exceed the gratification felt by all parties. On our road to the city we had frequent opportunities of observing the damages done by the earthquakes ; many cottages were entirely thrown down, and others totally uninhabitable ; the roads were choaked and almost impassible, from the hills having fallen in upon them in various places.

On the following day, Captain Tillard being anxious to have a view of the volcano from the ship, he invited a party to take an excursion by water, and I had the pleasure of making one. On rounding the west end of the island, we found that the volcano during the night had increased to a mountain, nearly conical, whose base formed almost an equilateral triangle, so that within the space of a few hours it had increased upwards of six hundred feet in height, and was still in full action ; in passing to leeward of it, nearly six miles distant, some of the clouds burst over the Sabrina, and covered the ship with sand and ashes, so as to oblige the ladies to leave the deck ; another grand explosion took place about four P. M. and at six a repetition. During the night the volcano was pretty quiet ; at intervals streams of fire were discernible, but it coming on to blow hard from N. W. we were obliged to keep a good offing ; at day light the next morning we returned to Ponta Delgada.

Since the 22d, the eruptions have entirely ceased; a strong smoke, however, continues to issue from the centre of the crater, which is still boiling, and the water of the sea is perfectly warm, at the distance of more than half a mile from the island. Several persons have landed on the island, but found the ground so hot as to oblige them to re-embark immediately; had the eruption continued much longer, in all probability a safe harbour would have been formed between the volcano and the Bahia dos Mosteiros."

The cliff from which these eruptions were seen, is composed of alternating layers of tuff, basaltic lava, and pumice. For some distance on both sides of it, the geological structure of the coast continues the same; but at the distance of about two miles farther west, the tuff becomes rather more abundant and much pumice is imbedded in it. Near the Ponta dos Mosteiros, many large masses apparently of tuff, are seen rising above the surrounding water. They are completely insulated and appear to have been separated from the island by some event like those already noticed, or by the incessant action of the waves having worn away the strata or enlarged previously existing fissures. Some of them appear like columns; and the strata, of which they are composed, still preserve the same relative situations in regard to each other and to those of the island, that they had when connected with it. It is probable that before the lapse of many years these masses will be greatly reduced in size, or overthrown by an earthquake and buried beneath the ocean.

Mr. Masson informs us that the inhabitants spoke of a high peak near this place, which did not exist at the time he visited the island. Other instances of phenomena, similar to those described, which have been observed in the vicinity of the Azores, are on record, or have been handed down to the present time in the traditions of the islanders.

A new island rose from the sea not far from Terceira, at successive periods in 1638 and 1719—in November, 1720, it was visible at seven or eight leagues distance, was three leagues in diameter, and nearly circular ; in 1723 it disappeared to the depth of 480 feet.* From the size of this island, it was inferred, that the quantity of erupted matter, must have exceeded all thrown from Vesuvius or Etna, for the two thousand years preceding.

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* Mem. de l' Academie, 1722, Fleurieu voyage, &c. Kircher has given an account of a dreadful earthquake, which happened in St. Michael at this time, continuing for eight days without intermission.

CHAPTER XIII.

GEOLOGICAL STRUCTURE OF THE NORTH-WESTERN PART OF ST. MICHAEL—VALLEY OF "THE SEVEN CITIES"—ARRAGONITE—CALCEDONY—OLIVINE—PUMICE—SURTURBRAND.

THE chain of high land, that runs through St. Michael, is terminated near the north-western extremity of the island by a crater of stupendous size; the upper edge of which cannot be less than fifteen miles in circuit. Its elevation probably exceeds two thousand feet.* The ascent along the southern escarpment is accomplished with comparatively little fatigue, a road having been formed over which asses travel with safety.

The mountain, in which this crater is situated, is skirted by hills composed principally of pumice, under which the tuff disappears as it recedes from the coast. It was only in the channels, worn by the torrents after heavy rains, that I observed any large masses of lava, or of any other rocks essentially different from the pumice. The rock of most frequent occurrence was a member of the trachyte family, and was distinguished by a bluish grey colour, often remarkably light. The basis of this rock was well characterised felspar, with a small proportion of hornblende in minute prismatic crystals, so arranged as to give the rock a delicately dotted appearance. Through this basis distinct crystals of greyish white felspar were abundantly distributed. Some of the crystals were half an inch in length. This porphyry had a dull earthy fracture, and very much resembled some varieties of clay-stone.

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* On arriving at the summit I discovered that my barometer had sustained an injury, and could not be relied on for determining the altitude.

From the point where the road crosses the summit of the mountain we have a distinct view of the enormous crater; the edge of which, going off on our right and left, appears to be far more extensive than when observed from below. The part immediately opposite to that on which I stood was so distant, that the most prominent objects upon it, were but indistinctly seen, and I was for sometime more disposed to imagine myself upon the ridge of some primitive mountain chain, than upon the brink of a volcano. The sides of the crater, which are covered with luxuriant ferns, slope down, in general, at an angle of about 45°, till they terminate in the enclosed plain at the bottom, called "vale das sette cidades," or valley of the seven cities. The circumference of this plain has been estimated by Mr. Masson at nine miles. About one third part of it is covered by water, divided by projecting points of land into two lakes, one called "lagoa grande," or great lake, the other "lagoa azul," or blue lake. The remaining two thirds are in a state of tolerable cultivation, and a few miserable cottages constitute the hamlet which has been dignified with the title of the seven cities.

The "vale das sette cidades" is composed of fine pumice and lava, which are covered in part by a fertile soil. A few large pieces of cellular lava, and prophyry similar to that already described, are scattered upon the surface. From the plain on the western side of the largest of the two lakes, rise two small hills, which, although they have been rounded by the rains and other causes, and are now overgrown with heaths and shrubs, exhibit some appearances indicating that they were elevated by an eruption. They are composed of coarse prophyritic pumice of a grey colour.

The side of the crater facing the west is more abrupt, and in a few places nearly perpendicular.

It is deeply furrowed by ravines reaching from its summit to the surface of the lakes. These ravines are so wide above, that they give to the edge of the crater in some parts the appearance of being constituted by distinct mountains.

On the side forming the western boundary of the valley, and which is composed of pumice, I observed considerable portions of compact, basaltic lava, disposed in the form of a vein; and many of the detached masses had an imperfect columnar shape. In these I found large crystals of vitreous felspar, and granular concrétions of olivine, of greater size than any I had before met with on the island; some of them were as large as a pigeon's egg.

The rocks, which had been in a great measure concealed by the superincumbent pumice, become more conspicuous after we cross the edge of the crater, and still lower down, on the inner side, form some steep precipices. These rocks, which are varieties of trachyte, are sometimes in large, imperfectly defined columns, and decline from the mountain at different angles, from 30° to 45°. They have a greenish grey colour and appear to be composed of felspar and hornblende. The crystals of felspar imbedded in them are vitreous, and strongly contrasted with the basis, which has very little lustre. Although the aspect of this porphyry on the fresh fracture is dull and somewhat earthy, it does not seem to have been produced by the decomposition of the felspar, nor was it confined to within a few inches of the surface; but large masses, when broken up, had the same character throughout.

The descent along the side of the crater looking to the north, is far more dangerous than the ascent on that facing the south. Ravines and precipices are more numerous within the crater, and some of them afford a passage to picturesque cascades.

For an interesting specimen, found about half way down the inside of the crater, I am indebted to the mineralogical taste of my guide, who, from observing me stop very often for the purpose of breaking the larger stones in the road, had begun to follow my example, influenced probably by the expectation of finding some precious metal. With great patience, and labour he had succeeded in extricating a large fragment of rock from the pumice in which it was imbedded, and was busily engaged in reducing the whole of it to a state of pretty minute division when I came up. On examination it appeared to be a porphyritic mass, but of much darker colour, and more compact structure, than any I had yet seen. It contained a large proportion of olivine, and was somewhat vesicular at the surface, which, in part at least, had arisen from the decomposition of the felspar; as portions of that mineral still adhered to some of the cells. In breaking the mass, a number of small cavities of an irregular shape, had been laid open; they varied from a quarter of an inch to an inch and a half in depth. Their surfaces were covered with a thin coat of blue calcedony, in small, mamillary concretions, upon which acicular crystals of arragonite, of a snow white colour, and radiating from a common centre, had been deposited. In some of these cavities were also small portions of mesotype.

The pumice, which constitutes so large a part of the sides of this crater, has been deposited in loose concretions, varying in size from that of a pigeon's egg, to that of a man's head. These concretions are for the most part of a grey colour, which inclines to brown, and rarely passes to brownish black. They are cellular and the form of the cells is generally elliptical; they are often crossed by delicate fibres of pumice, and are porphyritic. The crystals of felspar have a high vitreous lustre, and never exhibit any appearances of fusion or decomposition. They are prismatic and distinctly foliated, their colour is much lighter than that of the pumice, and they are sometimes half an inch in length.

In consequence of the presence, of mica, hornblende, and some other minerals which occur in granitic rocks, in pumice of the Lipari islands, and of other countries, some geologists have imagined that pumice is an altered granite. With the view of determining how far this hypothesis would hold in regard to the pumice of St. Michael, I examined innumerable specimens of it, but never discovered in them any other mineral than felspar. So far from exhibiting any relation to rocks of the more ancient formations, the pumice of this island could be traced in the most clear and satisfactory manner passing into obsidian, and there was every reason to regard the two substances as modifications of each other. I found many specimens one extremity of each being well characterised obsidian of a black colour, with a perfect conchoidal fracture, and a high degree of lustre; the other being equally distinct pumice; and the crystals of felspar were abundant in both. From the obsidian, slender laminæ pass off and are gradually lost in the pumice; and from the pumice, fibrous portions extend to, and penetrate the obsidian. There is no appearance of a distinct line of separation, but each substance gradually acquires the characters of the other. In some specimens there is a substance which cannot be referred either to pumice or obsidian, but which is rather a connecting medium between the two, it has a dull aspect and in many respects resembles porcelain-jasper.

The masses of obsidian and pumice, which have been described, occur in small quantity in this part of the island; and always in loose pieces at the base of the mountains. I shall have occasion to notice the obsidian more particularly in another place.*

From the village of the seven cities, a narrow, broken road passes up the northern side and over the edge of the crater, in the course of which the porphyritic rock that was observed on the southern side, projects in many places through the pumice. About half way up I found a number of loose stones composed of white vitreous felspar, and very dark coloured augite in large imperfect crystals. These specimens were so fragile that they frequently fell to pieces in the hand while under examination; and the two minerals separated entirely from each other.

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* Since my return to America, I have submitted a piece of the obsidian of St. Michael to intense heat, and found that its colour changed from black to greenish grey, and its structure from compact to cellular. From the experiments of Humboldt and Larea it appears, that some varieties of obsidian, on exposure to heat, increase to nearly five times their original bulk.

In the pumice I also found large limbs of trees in the state of bituminous wood. They were quite black, and had a distinct woody texture. Some of them were as hard as the surturbrand of Iceland, but the greater number were much softer, and some fell to powder under the fingers. From the appearance of many of the specimens it seemed probable, that the wood, which had undergone this change, was originally of a hard compact texture. The masses were always disposed in an horizontal direction. They did not constitute one entire bed, but were found at the distance of many yards from each other.

Having attained the summit of the northern side of this magnificent crater, the view is grand and picturesque. The two smooth and unruffled lakes are seen encircled by the mountain, and separated by the projecting points forming the narrow isthmus between them. The ridge slopes gradually down to the level of the water on one side, while on the other it is more abrupt and precipitous. Towards the foot of the mountain orange groves and patches of wild myrtle trees appear, and still lower down the white cottages and cultivated fields. To the east, as far as the eye can reach, mountains, and hills spread out; the acclivities being in some places clothed with rich green ferns, or in others furrowed by deep ravines, terminating in dark vallies. The whole scene has a wild and sombre aspect, and its grandeur is heightened by the vast expanse of ocean below, over which the eye wanders till it rests on the dusky outline of Terceira in the north-west, or of St. Mary's in the south-east.

As I descended along the northern side of the crater towards the sea, I noticed cellular lava, projecting in many places from the pumice. In one place it formed a bed six or eight yards in length, and had an exceedingly burnt appearance. A few of the loose masses were nearly of a brick red colour, and resembled the variety found in the vicinity of Rosto de Cao. The pumice is succeeded by tuff, covering the base of the mountain and continuing to the coast, which is as precipitous on the northern side of the island as on the southern.

CHAPTER XIV.

PONTA DA BRETANHA—OBSIDIAN PORPHYRY PASSING TO PUMICE—CAPELLAS—TUFF—RIBEIRA GRANDE—HOT SPRINGS—SILICEOUS SINTER.

FROM the summit of the crater described in the preceding chapter, the road winds through highly romantic mountain scenery, as it descends to the "Ponta da Bretanha." This point is very prominent, and forms a precipice between two and three hundred feet in height. It is composed principally of tuff, of a texture somewhat more compact than that of the tuff on the southern side of the island, and which has more effectually resisted the action of the sea. Large pyramidal masses of it are visible above water at the distance of some yards from the face of the precipice, with which they were once, probably, connected. From this point the coast has a direction nearly south-east, and for some distance preserves about the same height above the level of the sea. The road then becomes wider, and cottages and cultivated fields increase in frequency, on both sides of it. But little change in the general structure of the island is discoverable in this course; all the usual varieties of lava occur in it, and are sometimes seen on the coast, alternating with tuff; these alternations are, however, less frequent than on the southern side.

On the northern side of the hills of pumice, which are without the crater, I found some loose pieces of black, porphyritic obsidian, the largest of which were about two feet long, and from eight to ten inches thick. All of them had evidently been washed from their original beds, and were now scattered among the larger masses of pumice which had been left in the gullies and ravines. I had hopes of discovering this interesting mineral in its original situation, and of ascertaining whether the specimens found had been broken from veins or had formed portions of streams of lava. But in this I was disappointed, and all my exertions in tracing the loose masses were without success. All of them were angular blocks, and the angles and edges were sharp; they had a great tendency to assume a columnar form, and were separated into large prismatic concretions, on the application of a slight force; which, if increased, reduced them to still smaller concretions with convex and conchoidal surfaces. The surfaces of the larger concretions were covered with a thin, yellowish earthy coat, beneath which a brilliant, iridescent tarnish was generally observed. This appearance had undoubtedly been produced by exposure to air and moisture, and was confined to certain parts of the masses. It is not to be attributed, as is a similar appearance on the obsidian of some other countries, to innumerable small elongated bubbles in the interior of the specimens.* Although there were many cavities in the obsidian of other parts of St. Michael, they had not any effect of this kind.

These masses are rendered porphyritic, and their beauty is increased, by an abundance of prismatic crystals of pearly, white felspar; some of which are three quarters of an inch in length, and the eighth of an inch in thickness. They have a very high lustre, and are hard, but rather brittle. The black colour of the basis of most of this porphyry is not less intense and rich, than that of the obsidian from Iceland, but its structure is much less compact. The lustre, and other external characters in some specimens, render it difficult, at first sight, to distinguish them from pitch-stones.*

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* The *obsidienne vitreuse chatoyante* of Brongniart; found by M. M. Humboldt and Bonpland at la Serra de las Nabayas, in New Spain.

The most interesting specimens were those, which exhibited a distinct yet gradual passage into pumice. Many of these were flat pieces, not exceeding six inches in length; they were composed of two, and sometimes more, distinct layers, which almost imperceptibly lost their distinctive characters, so that no line of separation could be observed between them. The substances, by which these layers were constituted, were black obsidian without crystals of felspar, a substance analogous to porcelain-jasper, of a muddy blue colour, and well characterised pumice. Other specimens were composed of obsidian and pumice, without the intermediate substance; and although the transition was rather more abrupt than in the former pieces, it was not less distinct and satisfactory. They agree in every circumstance with the specimens found by M. Cordier in the island of Teneriffe.†

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* Some of them resemble the small prismatic concretions of pitch-stone porphyry which occur on the side of Caimenacallich in the island of Arran.

† "M. Cordier a rapporté de Ténériffe des obsidiennes brunes et vert-foncé, qui sont adhérentes à des Ponces, et qui présentent un passage non interrompu de l'obsidienne com-

The coast preserves its abrupt and precipitous character for some miles to the south-east, and many detached rocks of great size, which are probably composed of lava and tuff, are seen rising from the ocean at a short distance from the shore. The road winds amidst ravines and deep gullies in the pumice, and occasionally passes within a few feet of the edge of the precipice. The houses, and patches of land under cultivation, gradually become more numerous till the village of Capellas, with its vineyards and orange gardens, appears in sight. Scarcely any other rock is to be seen in its vicinity, than coarse yellowish tuff, from which variously shaped masses of compact and vesicular lava project. Some of them are a foot in diameter, and their edges and angles are sharp and unaltered, exhibiting no marks of attrition.

The tuff here contains but few pieces of pumice, and appears to consist of fine, and light ashes, which have been cemented under water; or which were ejected from the volcano in the state of mud, and subsequently became firm. It is arranged in very distinct strata, of different degrees of thick-

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pacte à la Ponce rude, vitreuse et à grandes cavitès, et enfin à la Ponce légère et soyeuse." Brongt. Traité de Min. Tome 1.

ness. For some distance we can trace along the face of the precipices a mass of eight or ten strata reposing on each other, each stratum being less than a foot in thickness; while that of others, above and below them, is from ten to fifteen feet.

From the general aspect of the strata, and from their relative position, and variable thickness, I was induced to think that, although the materials of which they are composed might have been ejected during one volcanic eruption, intervals of comparative quiet had occurred, as happened at the formation of the island of Sabrina. During these intervals the substances which had been already thrown out would be precipitated to the bottom of the ocean, and, being subjected to more or less compression from the superincumbent water, would acquire a degree of consistence sufficient to constitute a distinct stratum. On every recurrence of the eruption the same effect would ensue, and the intervention of water would cause all the separation necessary for rendering the stratified appearance more perfect. Whenever an eruption was prolonged, a greater quantity of matter being ejected, the stratum formed would be proportionably thicker.

The strata have not the same degree of hardness. Most of the thinner ones yield with difficulty to the knife, while the others are comparatively soft. The different degrees of resistance which they have made to the encroachments of the sea, afford the most conclusive evidence on this point. In many places on the face of one part of the coast, the thick strata have been washed away, and the superincumbent thin strata left entire. Excavations of different sizes have been formed, and so extensive are some of them that they are in fact, large caves. They are much frequented by the islanders, who enter them in boats when the sea is smooth, and obtain abundance of game; pigeons and other birds resorting to them in great numbers.

The village itself derives its name from these caves, or, as they are termed, "Capellas," chapels. It is delightfully situated at the foot of mountains that stretch nearly across the island, terminating in the Morro das Capellas, a high bluff overlooking the sea. The highest part of this elevation affords one of the most pleasing views on the island. The village is but partially seen in the midst of plantations of orange trees; the mountains behind it are skirted with corn fields, and, for some distance up their sides, covered with evergreens. Vegetation becomes less towards the summit of some of them, when the naked pumice alone shows itself, furrowed and cut into deep ravines, which increase in width as they ascend, and give to the outline a serrated appearance. Apples, pears, figs, and grapes are more productive here than in any other part of St. Michael, and they have a superior flavour.

From Capellas to Ribeira Grande there is considerable inequality of surface, and the land continues high. Where the tuff is not seen, its place is occupied by compact and slaggy lava, which, however, present no peculiar appearances.

Ribeira Grande, or great river, is the second town, in point of size, on the island, and contains about three thousand inhabitants. It is dignified with the title of city, and takes its name from a small stream that runs through it. The streets are narrow and irregular, but few people are seen in them, and a striking appearance of gloom, and desertion, every where prevails. The houses are constructed of lava, and are every way similar to those of the capital. There are two convents in the town; one for nuns, the other for Franciscan friars.

A few miles south-west of Ribeira Grande is a small valley, surrounded by hills of moderate elevation, where springs of hot water occur. The water rises through clay of a grey colour, tinged in many places with red, violet, brown, and blue. This clay is soft and has somewhat of a soapy feel; but when rubbed between the fingers it is rather gritty. When a mass of it is diffused through water, a considerable proportion of fine white sand is separated, which proves to be pure silex. The same earth occurs under the form of siliceous sinter, disposed in thin layers in the clay, in crusts, and stalactitical and globular concretions. Some of it has a delicate red tint, but the usual colours of the mineral are white and grey. The lustre in most of the specimens is resinous, but in some of them it is nearly vitreous. They are hard, scratching glass with ease.

Many of the cavities in the tuff and rocks, as well as most of the fissures in the clay, are so hot that, when a thermometer is introduced into them, the mercury immediately rises to within a few degrees of the boiling point. Sulphur is continually sublimed and deposited on the loose stones in beautiful fibrous crusts. Sulphuretted hydrogen gas, with an abundance of hot acid vapour, incessantly escape from the crevices in the ground.

These springs are occasionally resorted to by invalids, for the purpose of bathing, but are much less frequented than those in the valley of the "Furnas," which present many more interesting appearances, and where the accommodations are far superior.

As the quantity of hot water that issues from the springs at Ribeira Grande is not sufficient to fill a single bathing place, the following method has been adopted for obtaining the requisite supply, and for impregnating common water with the gas, and sulphureous vapour. A shallow pit, or basin, is formed in the warm clay, where the orifices are most numerous, and into this cold water is conducted. It is allowed to remain until its temperature is elevated to near 200°, during which time it also becomes chalybeate, and sulphureous. It is then conveyed to oblong pits, lined with rough stone slabs, which have been sunk in the clay floors of two or three small buildings, now fast falling to decay, from neglect.

It is unnecessary to enter into a more minute description of these springs, as those to be hereafter noticed present the same phenomena, on a more magnificent scale. I may, however, remark that the clay, which is so abundant in their vicinity, has evidently resulted from the action of acid vapours on the neighbouring pumice, tuff and lava. This opinion was also confirmed by a careful examination of the same substance near the springs of the valley of Furnas.

A few miles from the springs which have been described, is the largest and most picturesque cascade in St. Michael.

Crossing the central part of the island to the city of Ponta Delgada, I had an opportunity of examining the patches of lava, which I had before seen from the top of Pico do Fogo. They consist of compact blue lava, and accumulations of slaggy masses and scoriæ intermixed with the tuff. A few pieces of porphyritic obsidian were found in the soil, and one of them was particularly interesting, as it showed a partial transition into porphyritic lava.

CHAPTER XV.

STRATA OF TUFF AND LAVA—MOUNTAIN OF AGOA DE PAO—ITS GEOLOGICAL STRUCTURE—ROCK OF FELSPAR AND HORNBLENDE—TITANITE, &C.

Returning to the beach before noticed, on the southern side of St. Michael, and proceeding along the shore to the eastward, beds of coarse, earthy tuff, of a brownish yellow colour, occur between the village of Rosto de Cao, and the sea. It contains thin layers of vesicular and compact lava, and both have the appearance of regular stratification; the strata dipping to the north-west, under an angle of 45°. The same arrangement can be traced, at intervals, for some miles along the shore. In some places, the more elevated extremities of the strata, rising towards the south, overhang each other; while in other parts they appear to have been worn away by the sea, or shattered by earthquakes. Large portions of them, some of which exceed thirty feet in height, remain at a distance from their original situation, in the form of insulated columns in the sea.

From the village of Rosto de Cao, the land gradually rises towards the base of the picturesque mountain of Agoa de Pao. This mountain stretches nearly across the island, and on the south forms the Ponta da Galera, which bounds the bay before noticed, on that side of St. Michael. Viewed from the village it appears as an extended ridge, rising from the midst of smaller eminences, which stretch along its acclivity. The summit has a much less serrated outline than that of some other mountains on the island. It is seldom, however, entirely free from mist, and a magnificent effect is produced by the dense clouds which rest upon it in certain states of the atmosphere. The acclivity of this mountain towards the south-west is under good cultivation. Extensive orange gardens, and vineyards, interspersed with fields of corn, potatoes, and beans, are seen rising above each other for a considerable distance.

Where the foot of the mountain is not covered by soil it is composed of very porous lava, which, as we ascend, has a more scoriaceous aspect, and is finally covered by pumice. Through the latter, a rock very similar to basalt, but less compact, appears in the form of veins. Some of these can be traced to the distance of many yards, pursuing nearly a straight course from the north towards the south-west. Many large masses of lava, in which augite is the predominant ingredient, occur loose in the soil; when broken, they exhibit cavities from a quarter of an inch to an inch or two in depth. These cavities are more or less rough from small stalactites, and elongated portions of the lava, crossing them and attached at both extremities.

The sides of the mountain are deeply furrowed by ravines, and it is only through them that the ascent to the summit can be accomplished. They do not, however, pursue one uniform course to the base, but are often exceedingly tortuous, and, in some places, have nearly a horizontal direction. Although these ravines are often obstructed by rounded and water-worn fragments of rocks, rendering the ascent through them, fatiguing, they are peculiarly inviting to the geologist, as they expose the interior structure of the mountain. The mountain is, in fact, one vast accumulation of pumice, resting upon compact lava, which appears from under it in many places, especially, near the village of Agoa de Pao.

The loose masses found in the ravines were peculiarly interesting, and deserve particular notice. Some of them were about twice the size of a man's head, and, at first sight, might easily have been mistaken for pieces of granite. They are composed of felspar and hornblende, and contain a few scattered grains of magnetic iron. The felspar is divided into prismatic distinct concretions, which are from half an inch to two inches in length, and from an eighth of an inch to an inch in thickness. At the surface of the rocks the angles and edges of the felspar are rounded. The hornblende is in imperfect crystals, some of which are hard, while others are in a state of partial decomposition. The felspar constitutes much the largest part of each specimen. Its colour is light brick red, and in some parts flesh red, becoming fainter towards the interior of each concretion, where it is greyish white. It is hard, and has a high lustre, almost equal to that of adularia, with a foliated structure, which is very apparent. Angular spaces have been left between the concretions, in one of which I discovered a portion of transparent quartz having a red tint. The spaces are partially filled by crystals of hornblende projecting into them, and it is probable that they were once entirely occupied by that mineral. A small quantity of black mica adheres to the surface of one of the largest concretions of felspar.

The most singular circumstance in these masses, is the division of each one of them into a coarse and fine grained portion. The latter, composed likewise of hornblende and felspar, intimately mixed, and in nearly equal quantities, forms a nucleus, which is completely enveloped by the coarse concretions. There is no gradual transition from the one to the other, but they are so distinct, that, on the application of a slight degree of force, they separate from each other, and the nucleus, or fine grained portion, presents a smooth and convex surface. The lustre and translucency of the felspar, in all these fragments, is such as evinces that they could not have been subjected to a very elevated temperature.

If these rocks had been found on a mountain, composed of the *primitive* rocks of many geologists, they would have been described as granite, or sienite, and there is no reason why they are not, in their present situation, equally entitled to the name. Some geologists would probably consider them "as the debris of the walls of the volcanic caverns," and as having been thrown up from the ocean; while others might see in them those elements, which had not been sufficiently heated to combine and form greenstone.

The occurrence of fragments similar to these, in the vicinity of volcanoes now in a state of activity, is not uncommon. Bory St. Vincent, in his "Essai sur les Isles Fortunées," has described appearances of this kind, and Humboldt examined a fragment of rock thrown out by Vesuvius, which was a real mica-slate.*

A careful examination of Agoa de Pao, and of many other mountains on the island, satisfied me that the original situation of these rocks is not now to be discovered; neither were any fragments resembling them met with in any other part of St. Michael. As they were not found in the immediate vicinity of any buildings, near the sea shore, nor at the base of the mountain, 'but at an elevation of not less than one thousand feet above the level of the sea, and in a ravine, probably, never before trodden by human being, it cannot be supposed that they had been conveyed by accident or design, to the spot where they were discovered. There are rocks, however, in some places near the city, which might be supposed portions of the rocky masses composing the island ; but all these can be identified with the limestone of Portugal, whence they were brought, either as ballast, or for architectural purposes. In examining any tract of country, the geologist cannot too often call to mind the remark of Humboldt, that he "is exposed to a thousand errors, if he loses sight of the changes, which the intercourse between nations produces on the surface of the globe."

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* The specimen in the collection of the late Dr. Thomson, is well known to geologists in Europe, and has been thus particularly described by Humboldt. It "is a fragment of lava enclosing a real granite, which is composed of reddish felspar with a pearly lustre like adularia, quartz, mica, hornblende, and, what is very remarkable, lazulite. But in general," he continues, "the masses of known primitive rocks, I mean those which perfectly resemble our granites, our gneiss, and our mica-slates, are very rare in lavas; the substances we commonly denote by the name of granite, thrown out by Vesuvius, are mixtures of nepheline, mica and pyroxene. We are ignorant whether these mixtures constitute rocks *sui generis*, placed under granite and consequently of more ancient date, or simply form either intermediate strata, or veins, in the interior of the primitive mountains, the tops of which appear at the surface of the earth." *Humboldt's Pers. Nar. Vol.* 1.

Other masses were found in the ravines of Agoa de Pao, which are composed entirely of greyish white felspar, with a highly splendent lustre, and distinct foliated fracture. The concretions of felspar are small and can be easily separated by the fingers. Small spaces occur between them, in which are crystals of titanite, and hornblende. Many of the former, are acicular, and radiate from a common centre; their length is seldom more than the eighth of an inch. In the same specimens a few crystalline grains of augite, are discovered.

Above the altitude of two thousand five hundred feet, the pumice, which composes so large a portion of this mountain, is destitute of any covering of soil, except in a few sheltered spots; and a little further on, all traces of vegetation disappear. The pumice is of a dark grey colour, and like that of most other parts of the island, abounds in crystals of felspar; it is light, and porous.

A distinctly porphyritic rock rises through the pumice at the summit of the mountain. It has a light grey colour, with minute black specks, and resembles some of the trap porphyries of the extinct volcanoes of the Rhine. The highest part of the mountain, is a small naked rock, of this kind, which by barometrical observations was found to be three thousand six hundred and forty-five feet above the sea.

The view from this point is grand and extensive, presenting on the east innumerable peaks and ridges, rising above each other, which are contrasted with long and narrow vallies and deep ravines. Here and there a smooth sheet of water is seen within an ancient crater. On the south is the ocean, with the island of St. Mary rising from its bosom. On the north and west, fertile plantations, with the villages, and detached houses and cottages, are scattered over the portion of the island between the two bays.

CHAPTER XVI.

VILLA FRANCA—ISLAND OF VILLA FRANCA—NORTH-EASTERN PART OF ST. MICHAEL—PUMICE—OBSIDIAN—VARIETIES OF PUMICE.

Between twelve and fifteen miles eastward of the city of Ponta Delgada, on the southern side of the island, is the town of Villa Franca. It contains about the same number of inhabitants as Ribeira Grande, and has the same number of convents. The fruit gardens, vineyards, and plantations in its vicinity are numerous.

The road from Ponta Delgada to this town affords many opportunities of ascertaining the relative situation of the lava, tuff, and pumice. The former, with but few exceptions, forms the lowest stratum visible on the face of the coast. Its characters are every way similar to those of the basaltic lava so often mentioned. For some miles on both sides of the town, the coast is abrupt, and its height above the level of the sea, in some places exceeds two hundred feet. Here and there, at the distance of many yards from the shore, the black and craggy tops of huge masses of lava are seen rising from the ocean, while the situation of others is marked only by the rapid eddies and foam.

At the foot of the precipice within a short distance of the town, a vast quantity of blocks of lava have accumulated at the water's edge. In descending to them I noticed thin beds of lava included in the tuff. They were porous, and contained innumerable grains of olivine. The tuff has a dingy yellow colour, is soft enough to yield to the knife, and includes small angular fragments of all the varieties of lava met with on the island. It appears to have been deposited in nearly horizontal strata, varying in thickness from one to three feet.

The inhabitants of St. Michael have a tradition, that the harbour of Villa Franca was formerly easy of access, and a safe anchorage for vessels, and that it was destroyed by an eruption, or earthquake. But the accounts, which can be obtained, are so contradictory, and so mingled with the exaggerations of superstition and credulity, that no reliance can be placed on them. In confirmation of this tradition, I was told that rings of iron remain at this day, in the rocks at some distance from the shore, which are supposed to have been intended for the mooring of vessels—but I was never fortunate enough to see them. There are, however, many geological appearances indicative of a great eruption of lava, and subsequent deposition of mud and ashes now consolidated into tuff, and, at low water, ridges of lava are seen in front of the beach.

Immediately in front of the town of Villa Franca, at the distance of about a mile from the shore, is an island which is supposed to have been connected with St. Michael previous to the eruption or earthquake that destroyed the harbour; but no positive testimony can be obtained respecting it.* This island is remarkable for its singular shape and geological structure. It is in fact a basin, and has every appearance of having been the crater of a volcano, now extinct. It is nearly circular, and presents an abrupt precipice to the sea, except on the side opposite to the town where it slopes gradually down to the water, an opening being left into which the sea enters. This entrance is just sufficient to admit a small vessel, and the depth of water is about eight feet. The diameter within, at the surface of the water is at least six hundred feet, and the greatest depth of water, at present, is usually eighteen feet. From the surface of the water within the basin, the sides, which are composed principally of tuff, rise at an angle of about 45°, till, on the south-west, they attain the elevation of nearly four hundred feet above the level of the sea without. The diameter at the upper part, or lip, of the crater, probably exceeds nine hundred feet. As the sea, with south-east winds, breaks over into this basin, vessels cannot remain in it with safety, otherwise it would form a safe and convenient harbour.

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* See an enlarged plan of this island on Map 2.

There are no houses upon this island, but a considerable portion of the upper part of it is covered with soil, and produces good crops of maize and beans.

The tuff of which the island is composed consists of small fragments of scoriæ, lava, and pumice, cemented by a yellowish paste, having somewhat of an argillaceous aspect. The general character of this substance agrees pretty much with that of the tuff found on the main island, and there are some grounds for the belief that the two were once united. But as I found no large masses of lava or other rocks in the tuff, and as it was arranged in strata dipping towards the centre, I was rather disposed to view the whole of the island, as having been thrown up by an eruption, and to attribute its present form to the subsequent sinking in of the ejected substances.

The island is crossed by fissures, varying in width from an inch to two or more feet, and they extend through the tuff down to the water, which is heard rushing through them with great rapidity. In some of these fissures the arrangement of the layers of tuff is well displayed ; they have a very uniform thickness, and are disposed upon each other with great regularity. There are no appearances of the fissures having been produced by violence, as by the injection of lava from below, nor do any of them seem ever to have been filled up.

On the south-eastern side of the island, and at a considerable distance from it, a pyramidical mass of tuff, apparently between thirty and forty feet in diameter, rises immediately from the ocean. Through this column, the stratification is beautifully preserved, and it appears like a work of art, composed of blocks from one to two feet in thickness, piled upon each other with much regularity ; and there can be but little doubt that it was, at one time, connected with the basin. A fissure, similar to those now visible in the island, might have been gradually enlarged by the constant action of the waters of the ocean. The strata, composed of materials easily broken down, would yield, and the fissure be extended yearly, till at length a portion would be left perfectly insulated. This process is undoubtedly going on at this day, and there is abundant cause to believe that every trace of the small island itself will, before a great lapse of time, be entirely removed.

Leaving Villa Franca, and proceeding to the north-east, the road, rough and broken, continues over lofty hills and through deep and desolate ravines. The whole aspect of this part of the country is rugged and mountainous, the vallies are thinly inhabited, and the cottages are few and wretched.

A few miles from Villa Franca, the mountains exceed two thousand feet in height, and are, apparently, every where covered with pumice. As this substance readily yields to the heavy rain, which so often falls, deep gullies and frightful chasms have been scooped out. The width of these varies from five to fifty, and even an hundred feet in some places; and they are frequently more than three or four hundred feet in depth. All the chasms, as well as the streams of water, run from the central high land, to the sea on either side of the island.

The quantity of pumice on the mountains is exceedingly great; indeed scarcely any other mineral substance is seen. Sections, of many hundred feet, exhibit the loose concretions, heaped upon each other, often with great regularity, and in nearly horizontal layers. The concretions exceed a foot in diameter, and are for the most part porphyritic; the crystals of felspar being very distinct, with a strong vitreous lustre. The colour of the pumice is a dark grey, passing to brown, and sometimes nearly black. The texture, is rather coarse, and we find none of the more delicate varieties, so common in the Lipari islands. The form of the masses is always angular. The pores are abundant, and generally elongated, but in no constant direction, which would probably have been the case, had this pumice flowed from a crater, as some geologists have imagined must have been the fact, in regard to that of some other countries.

On descending into the ravines, where the pumice has been washed away, I found masses of compact basaltic lava, and a few blocks of a porphyritic rock, the basis of which was grey felspar, dotted with hornblende. Some pieces were hard, and had more or less of the characters of clinkstone, but contained olivine, with here and there a scale of mica. Pieces of a rock similar to this, but with rather more hornblende, and some augite, were observed in ascending some of the mountains in this part of the island, but there were no indications of beds of it.

The occurrence of so many masses of trachyte, in this and other parts of St. Michael, renders it not unlikely, that they were derived from beds beneath the pumice, and may constitute the central nucleus of the island.

Among the loose rocks in the ravines, some masses of obsidian were found, of a black colour, with a vitreous lustre, and perfect conchoidal fracture; containing numerous crystals of white felspar. These pieces seldom exceeded two feet in length, and one in breadth; they had evidently been long exposed to the action of air and moisture, yet still retained all their distinctive characters, well marked. They had, however, a peculiar tendency to break, on the application of a slight force, into rhomboidal fragments; arising probably from exposure. This porphyritic obsidian passes distinctly into a substance analogous to porcelain-jasper, having a compact texture, and blackish blue colour, but with a dull earthy aspect.

The structure of the mountains in this part of the island, exhibits little variety, pumice being the prevailing mineral substance. In some places, considerable quantities of red cinders and scoriæ are disposed, in the form of beds, in the pumice, and the line of separation is perfectly distinct; both substances preserving their distinctive characters, at their junction.

In one place, a bed of the blue basaltic lava containing olivine and augite, was observed in a section produced by the torrents. It was nearly seven feet in thickness, and completely surrounded by the pumice; the portion of which, in contact with the lava, showed no difference in compactness, or structure, from that of other parts, at a distance from it.

There appear to be two varieties of pumice in this part of St. Michael, which are well distinguished from each other, both by their external characters, and their relative situation. Immediately upon the tuff, surrounding the bases of the mountains, is the first variety, which continues about one third the way up their acclivities. It is, however, at first difficult to be distinguished from the tuff, but after examining it in various parts of the island, and comparing it with the tuff in hand specimens, it is found not only to have in general a deeper tinge of brown, but to be full of minute circular pores, and, when reduced to powder, to have a far more gritty feel. It is more brittle than the tuff, and is not reduced to powder under the hammer like that rock, but cracks and gives off small splinters. From the difficulty of referring it to tuff, and from its closer resemblance to pumice, I have preferred to describe it as a variety of the latter. The upper part of the mountains is composed of the second variety of pumice, which has a grey colour, and abounds in elongated cells, and crystals of felspar. The cells are often crossed in every direction by delicate fibres, and threads of pumice, forming a beautiful net-work.

Obsidian also is found occasionally, among the loose pumice on the mountains north-west of Villa Franca, and as some of the specimens have pumice on one side, the characters of which are the same with the pumice from the lower part of the beds, it is highly probable that they were detached from that part of the mountains. All endeavours to discover the obsidian *in situ* were without success, and it was never met with at great elevations.

CHAPTER XVII.

MOUNTAIN OF GUAITEIRA—ALAGOA DAS FURNAS—HOT SPRINGS.

In proceeding from Villa Franca towards the eastward, the mountains are soon observed to become more connected, and to increase rapidly in height. The road for a few miles is tolerably good, but, as it approaches the more considerable elevations, becomes narrow and winding. It passes over the summit of one of the loftiest mountains between Villa Franca and the valley of the Furnas. This mountain is called Guaiteira, and, from barometrical measurement, was ascertained to be two thousand nine hundred and ninety-seven feet above the level of the sea at Villa Franca. Guaiteira, like the mountains already noticed, is composed principally of pumice; its summit is covered with a rich black soil, in which wild myrtles, and ferns of great size and beauty, flourish luxuriantly.

The innumerable summits of the surrounding ridges, seen from the highest part of Guaiteira, which rises above them, appear like the waves of the most boisterous sea, suddenly arrested at the moment of their greatest elevation. The illusion is heightened by light patches of naked pumice on many of the mountains, which have very much the appearance of distant foam, and are more conspicuous from contrast with the deep green of the exuberant vegetation, that covers their acclivities. The intervening vallies are narrow and deep, stretching nearly across the island with great uniformity of direction.

Descending from this mountain, we wind along a narrow and dangerous road, and soon enter rugged and romantic glens of great extent. The ferns, many feet in length, hang in profusion from the precipices, and clumps of myrtle and box trees spring from every fissure where soil enough can be retained for their support. Streams of water flow at the bottom of most of the glens, and are supplied by numerous cascades from the precipices. They are often swollen, after heavy rains, into tremendous torrents, carrying off the loose pumice and deepening the glens still more. In this manner also, chasms of great size are formed every year.

Having ascended other mountains, we at length discover a valley of greater extent than any yet noticed; it is entirely surrounded by mountains and precipices, exceeding a thousand feet in height; from some of which, cascades of great beauty fall into a lake many miles in circuit. This is the "Alagoa das Furnas," or lake of the Furnas; the depth of water in it varies with the greater or less fall of rain, from which it seems to be principally supplied. At the time I visited this valley the quantity of water was comparatively small, covering but about one half of the plain; its circumference, even then, was probably more than five miles. On the shores of this lake, wild ducks, and other kinds of game are met with, but they were formerly much more abundant.

The surface of the plain where it is not covered with water, is strewed with water-worn pieces of pumice, lava, and every variety of rock met with in other parts of the island; and great quantities of fragments have accumulated at the foot of the surrounding mountains. Among these I found two pieces which are composed of white vitreous felspar in small concretions, loosely aggregated, and between the concretions are many small spaces partly occupied by brilliant plates of specular iron, *(fer oligiste laminaire.)* In one of the cavities the crystals are acicular and divergent.

Proceeding along the borders of this lake, we presently discover columns of light vapour and smoke ascending from the shore at the northern extremity. An indistinct rumbling and hissing noise is heard, and the columns of vapour are at last seen to rise from numerous springs of hot water, boiling up through orifices in the ground. The whole of the plain between the lake and the northern boundary of the valley, an extent of several acres, is composed of white and grey aluminous earth, and is strewed with pieces of lava and pumice. The ground and many of the stones near the springs are so hot that they cannot be touched with impunity. The stones are externally white, but when broken are seen to become darker towards the centre, where they are brownish black. In the larger masses this transition is very gradual, and is accompanied by an increase of density from without, inwards. Pieces which are so soft externally as to receive an impression from the finger nail, are hard enough in the centre to give sparks with steel. I found large masses of a yellowish white colour composed of distinct concretions, or perhaps more correctly fragments, united to each other, but without any visible cement, and which could be separated with ease.

Although these rocks resemble those of Iceland, which Olafsen and Povelsen consider as having been produced by hot springs, their appearance, and all the circumstances which characterise them, show that they are not depositions from the waters. The compact portions of many of the St. Michael specimens so closely resemble the lava and other rocks found in different parts of the island, that I was disposed to view them as fragments, which had been more or less altered by exposure to hot acid vapours. "Le couleur blanche," remarks Dolomieu, "des pierres de l' interieur de tous les craters énflammés est produite par les vapeurs acido-sulfureuses qui les penetrent, et qui se combinent avec l'argile qui leur sert de base y formant l'alun que l'on retire des matières volcaniques."—"Cette alteration des laves par les vapeurs, acido-sulfureuses est une espeçe d'analyse, que la nature fait elle meme, des matieres volcaniques. Il y a des laves, sur lesquelles, les vapeurs n'ont pas encore eu assez de temps d'agir pour les dénaturer entierement, et alors, on les voit dans differens états de decomposition que l'on reconnoit par la couleur."*

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* M. Ferber also noticed the conversion of lava into clay, on Vesuvius, and remarks that pots made of clay and baked are again rendered ductile by exposure to the acid vapour.

Every interstice in the ground, and the surfaces of many of the loose rocks, are incrusted with sulphur, which is sometimes crystallized in acute three sided pyramids, but more commonly in delicate fibres. A considerable quantity of it might be collected here in a short time. Silex is deposited from the water, under a variety of forms, and many small pieces of pumice and altered lava are cemented by it.

I visited these springs on the second day of December, about noon. The temperature of the atmosphere, as indicated by a delicate thermometer in the shade, was 67° Fahrenheit, and the barometer stood at 29.7. The temperature of the water in some of the springs was as follows :—

142°——79°—182°—173°
110°—193°—117°——94°
98°——87°—191°—109°
121°—190°——97°———

From the escape of vast quantities of steam, it is probable that the temperature below the surface is at the boiling point. The water has a turbid appearance, and is in a state of violent ebullition, which arises in a great measure from the escape of sulphuretted hydrogen and carbonic acid gases.

In the vicinity of these springs, yet in a situation where they are not now exposed to their influence, are large fragments of a brecciated rock, composed of angular pieces of lava and pumice, cemented by a yellowish siliceous matter. This cement is hard and crystalline, having some resemblance to calcedony.

The varieties of siliceous sinter, which occur here, and in the vicinity of the other hot springs of the island, will be more particularly described in connexion with those of the valley of the Furnas.

The road passes along the side of the hills, and gradually ascends, till it attains the elevation of between eight and nine hundred feet; in this course many natural sections of great extent and depth expose no rocks but pumice, and now and then loose cinders. At different elevations, and in different parts of these enormous beds of pumice, considerable quantities of bituminous wood were discovered, partly in the pumice, and partly projecting from it, in a horizontal direction. In some places, distinct trunks of trees, of a diameter far exceeding that of the present growth of wood upon the island, were observed in the road; many of them rise through the pumice in a natural position, appearing as if this had been their original situation. All of them are in a state very similar to that of the surturbrand of Iceland, but have rather less compactness. They retain the ligneous structure, but are not sufficiently firm to admit of being worked. They were brought to view, by the removal of the pumice, when the road was cut on the side of the mountain, and were, previously, more than fifty feet below the surface.

Having attained the summit of the mountains at the northern extremity of this valley, we discover a second one of about the same extent. It is divided into many small plantations by hedges, and, from the elevation whence it is first seen, has the appearance of a garden laid out with studied regularity. This valley, like the last, is encircled by mountains of pumice, over which the road is continued to the Valley of the Furnas.

CHAPTER XVIII.

VALLEY OF THE FURNAS—RIBEIRA QUENTE—AMYGDALOIDAL ROCK—PETRIFACTIONS—SULPHUR—CALDEIRAS—SILICEOUS SINTER—BRECCIA.

THE hot springs of the "valle das Furnas"* render this the most interesting spot in St. Michael. The valley is nearly twelve miles in circumference, and is bounded on every side by mountains of various height. Its form, like that of the other enclosed vallies, which have already been described, is nearly circular, but its surface has considerable irregularity, rising here and there into small hills. A part of it is under tolerable cultivation, and it is inhabited by a few peasants. It is watered by many streams that wind through the plantations, till they unite to form a small river, called "Ribeira Quente," or warm river. After a circuitous course the Ribeira Quente flows through a deep ravine, and empties itself into the sea on the southern side of the island at the base of Pico da Vigia.

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* The Portuguese word "*Furnas*," means caverns.

The mountains surrounding this valley are composed chiefly of pumice, but compact lava and rocks of the trachyte family are seen on the face of many of the precipices. The columnar structure and vertical arrangement of these rocks are quite distinct in some places; in others, beds of the porphyry and pumice appear to alternate. They are sometimes separated by layers of fine sand or ashes. A few pieces of slaggy lava and scoriæ, are occasionally found at the foot of the mountains, but there are no large collections or beds of them.

At the bottom of one of the precipices I found a number of pieces of a rock, analogous to amygdaloid, and at the same time porphyritic. Each piece is composed of angular portions, apparently fragments, which are united by a yellowish white siliceous substance, approaching in some respects to calcedony. It is hard and opaque, and has somewhat of a waxy lustre. The cavities, on which the amygdaloidal character of this rock depends, contain a small quantity of mealy and radiated zeolite.

The hot springs are situated towards one extremity of the valley, beyond a few cottages composing the village of Furnas. They are not seen at any distance, being surrounded by small hills, some of which, there is great reason to believe, owe their origin in part, if not altogether, to the springs themselves. They are generally covered with short shrubs, but some of them are wholly devoid of any traces of vegetation. They are composed of clay of different degrees of compactness, which is variously, and often beautifully coloured by iron under different degrees of oxidation. The clay is intermixed with fine pumice and masses of siliceous sinter. As we pass along the narrow road from the village to this spot, the gradual change from a fertile to a barren soil is observed, and within a few yards of the hot springs nearly all traces of vegetation are lost. At the extremity of the road the ground is almost snow white, and then acquires a reddish tinge; this increases in intensity and brightness, and finally passes through an infinite variety of shades to a deep brown. Here and there, patches and veins of a brilliant yellow and purple colour add to the singular aspect of this remarkable spot. The clay is in some places so much indurated as to retain an imperfect slaty character, but most of it is soft and has an earthy aspect. It does not feel perfectly smooth when rubbed, but is full of hard grains, which are exceedingly minute; and when a mass of it is diffused in water, a quantity of fine siliceous particles is separated. It has many of the characters of tripoli. It is used by the peasants as an external application for cutaneous diseases, and is undoubtedly beneficial in some particular cases, from the quantity of sulphur it contains. Large pieces of siliceous sinter of a grey colour are imbedded in it, and it is covered in some parts by the same substance, which has accumulated upon it in layers, from an eighth of an inch to an inch in thickness. Near the extremity of the road the beds of clay have been cut through to the depth of six or eight feet, and their structure is well displayed.

The vicinity of the springs is indicated by the increased temperature of the earth, a sulphureous odour, and the escape of vapour or steam from every crack and fissure in the ground. The temperature of the clay continues to increase as we advance, and a greater quantity of vapour is at last seen slowly ascending from the springs themselves.

The volumes of smoke and steam rolling upwards from the surface to a great height, till they are gradually diffused through the atmosphere, or mingle with the heavier clouds that crown the summit of the mountains, produce a striking effect. The confused, rumbling and hissing noise, that is heard for some time before we arrive in sight of the springs, increases at last to an incessant and terrific roar, and seems to issue from the very spot on which we stand. The earth returns a hollow sound, and great caution is required to avoid stepping into the pools and streams of boiling water, with which its surface is covered.

The quantity of hot water discharged through the innumerable orifices in the ground is prodigiously great, and the different streams unite, forming a small river that, still hot, joins the Ribeira Quente. The largest springs are termed "caldeiras," or boilers, and a shallow basin of earthy matter has been formed round each of them, by depositions from the water. Much of the water is constantly retained within these reservoirs, and its surface is more or less agitated by the escape of sulphuretted hydrogen gas, and the ejection of the water from below. The temperature of some of these springs on the second day of December, between three and four o'clock, P. M. the thermometer standing at 68 Fahrenheit—the barometer at 29.4, was as follows :—

207°—200°—96°—187°—208°
196°—184°—170°—73°—114°
184°—94°—122°—171°—147°*

The basin of the largest spring, particularly designated as "*the caldeira,*" is circular, and between twenty and thirty feet in diameter. The water, in this, boils with much greater violence than in any other caldeira, and distinct loud explosions occur at short intervals, which are succeeded by a very preceptible elevation of the centre of the body of water within the basin. This is attended with a loud hissing noise, and the escape of great quantities of sulphurretted hydrogen gas, steam, and sulphurous acid vapour. On account of the high temperature, and vast quantities of steam, it is dangerous to approach near this spring, except on the windward side. The cattle, however, are often seen standing on the opposite side, to free themselves, as it is supposed, from vermin. The peasants are in the habit of placing baskets filled with lupines, beans, and other vegetables, on the edge of the basin, where they are speedily cooked.

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* The above are put down in the order in which they were examined.

From the great caldeira, the water is conveyed to two or three small buildings, which are used as bathing houses. The temperature of the water being so high, reservoirs have been sunk, by removing the earth to the depth of a foot or two, into which the hot water is conducted, and allowed to cool; it is then received into bathing houses,* and its temperature raised at pleasure, by the admission of more water, immediately from the caldeira. The water is turbid from the presence of a large quantity of aluminous earth, but which gives to it a peculiarly soft feel.

A few yards from the principal caldeira, is an elevation about fifty feet in height, and probably as many in extent, composed of alternate layers of a coarser variety of sinter, and clay, including grass, ferns, and reeds, in different states of petrifaction. Not many years since, the side of this hill fell in, and discovered a deep and frightful cavern; smoke and steam at present issue from it in vast quantity, accompanied by a tremendous noise. The hill indeed appears to be a dome, covering an extensive abyss, from which, by another outlet nearer the summit, hot mud, and stones have been occasionally ejected. Looking down through this opening, a body of water is seen boiling with great violence. An appalling roar is incessantly reverberated from side to side within the dome, and is increased at short intervals, by sudden and violent explosions. The surface of this hill, the sides of the cavern, and the innumerable crevices in the ground, are coated with sulphur; in obtaining specimens of which, I found the heat and acid fumes almost suffocating. Every stone has been more or less changed, while not a shrub or plant flourishes for many yards around. The thermometer introduced into the fissures immediately rose to 120° and in some places to 123° Fahrenheit.

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* The bathing houses are similar to those at Ribeira Grande.

Sulphur is so abundant and pure that it might be collected in quantities sufficient to export; wherever a loose stone lies over one of the fissures, or where many stones are loosely heaped together, their under surfaces are soon covered with it; and by placing tiles, as is done at Solfatara, on which the sulphur could collect, an abundant supply of it would be obtained.

Wherever the water has flowed, depositions of siliceous sinter have accumulated, and circular basins, composed entirely of this substance, have been here and there formed round a spring.

The siliceous matter rises, in many places, eight or ten inches above the level of the water, and is often exceedingly beautiful. Vegetables, grass, leaves, and similar substances which have been exposed to the influence of the water, are more or less incrusted with silex, and exhibit all the progressive steps of petrifaction; some being soft, and but little differing from their natural state; while others are partly converted into stone, or perfectly consolidated. In many instances, alumina is the mineralizing material, which is likewise deposited from the hot waters. I found branches of the ferns which now flourish on the island, completely petrified, preserving every appearance as when vegetating, excepting the colour, which is now ash grey. Fragments of wood, occur more or less changed, and one entire bed, from three to five feet in depth, is composed of the reeds so common on the island, completely mineralized, the centre of each joint being filled with delicate crystals of sulphur, in elongated, double four-sided pyramidical crystals, with a highly resinous lustre.

Round the springs, where the water has dashed irregularly over the edge of the basins, the depositions of siliceous matter, are rough, and often present an appearance, similar to those of Iceland, which have been so well compared by Sir George Mackenzie, to the heads of cauliflowers.* The variety of siliceous sinter, which is most abundant in St. Michael, is in layers from a quarter to a half an inch in thickness, which are accumulated on each other, to the height often of a foot and upwards, constituting distinct and wide strata, many yards in extent. These strata, are always parallel, and for the most part horizontal, but in some places they are slightly undulating. Between the layers of this substance, is a loose, white powder, which, on examination, is found to be nearly pure silex, with a small proportion of alumina. When moist, it is nearly gelatinous. The colour of the slaty variety is pearl grey; externally it is dull, but on the fresh fracture has a glistening lustre; it is translucent on the edges. The fracture is nearly smooth, inclining a little to conchoidal. It scratches glass with ease, and has a specific gravity of 2.107. It is infusible before the common blow-pipe.

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* In the year 1817, I had an opportunity of examining the interesting suite of Icelandic specimens deposited by Sir George Mackenzie, in the apartments of the Royal Society in Edinburgh; but I recollect no specimens of siliceous sinter, which equal in beauty, some of those from St. Michael.

Another variety of sinter has a snow white colour, and is externally wrinkled, abounding in slight depressions, and protuberances, which are almost circular. This is found in delicate crusts, and often covers irregularly shaped masses of the other varieties. It has a very beautiful semi-opalescent lustre. The crusts are brittle, and seldom exceed the tenth of an inch in thickness. Their specific gravity is 1.886. Upon masses of a kind of conglomerate of altered lava and pumice, I noticed a very beautiful variety of fiorite, in small circular cup-shaped portions, the edges of which are of a pure flesh red, becoming gradually fainter, till the centres are perfectly snow white.

Another variety has the following characters: its colour is snow white, reddish and yellowish white, passing in some specimens to yellowish grey. It occurs in long, slender, capillary filaments from one to four inches in length. The filaments cross each other in every direction. On the cross fracture, viewed with a microscope, a lustre between vitreous and pearly is observed. It is translucent, brittle, and light. When reduced to powder and rubbed over the surface of a plate of glass, it scratches it. Its specific gravity is 1.866. It is insoluble in nitric, muriatic, or sulphuric acids, and is infusible before Brooke's blow-pipe. A portion of this mineral was examined by my friend

Dr. Dana, who found it "fusible into a perfectly transparent glass when mixed with an alkali, and that six grains of it in fine powder intensely ignited in a platina crucible for 15 minutes, lost 0.98125 grains, equal to 16.35 per cent." It appears from Dr. Dana's analysis to consist of silex 83.65—water 16.35. It thus differs from the siliceous depositions of Iceland and Ischia, in the large proportion of water it contains, and in the absence of alumina and lime. It may be considered an hydrate of silex with more propriety, than the hyalite of Francfort, which M. Bucholz regards as such, and which contains but 6.33 of water.* It appears to be a new variety of siliceous sinter, and deserves to be designated by an appropriate name. From the island in which it occurs, I propose to call it Michaelite.

Wherever cavities exist in the large masses of sinter, and in the hills formed by that substance and the fragments of lava and pumice, the silex has assumed a stalactitic form; the stalactites are from one to two inches in length, and their surfaces are often covered with small, brilliant *crystals* of quartz. It is impossible to convey any adequate idea of the beauty and variety of forms, under which silex appears in St. Michael, and mineralogists can here be supplied, with specimens far surpassing those from any other localities as yet described.

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* Klaproth analysed a quartzose concretion from the Isle of France, which contained twenty-one per cent. of water.

Another variety of stalactite that occurs here is composed principally of alumina. These stalactites are rough and earthy, and also tubular. Their length is from one to six inches.

The more compact masses of sinter broken down by the weather, and other causes, have been cemented together, with portions of obsidian, pumice and scoriæ, into a very beautiful breccia, which is in some places sufficiently hard to admit a good polish. The cement is siliceous sinter. The different substances of which this mass is composed, exhibit a great variety of colour, and the fractured surface is curiously mottled with green, red, grey, white, yellow and black, in every variety of shade. Some of the portions, have external characters analogous to those of wax opal, and many are striped and spotted, while others are porphyritic. This breccia is evidently of recent formation, and appears indeed to be actually forming at this time in those parts of the beds where it is soft, and the cement gelatinous. The alteration which the rock has undergone, in many places, where exposed to the steam and acid vapours, is remarkable. The different substances composing it have lost their colours, and have now a pretty uniform degree of whiteness; the brecciated structure remaining. The fragments are soft, and in many places have acquired a distinctly argillaceous character. Some of the elevations composed of this breccia, are upwards of thirty feet in height. Wherever cavities occur in it, they are lined with small stalactites, and botryoidal concretions of pearl sinter (*fiorite* of Thomson,) and alum appears under the form of a delicate efflorescence, or in minute crystals.

Besides the hot springs already noticed, there are some others of less importance in different parts of the valley of the Furnas, and bathing houses have been erected in their vicinity. There are also many cold springs, the waters of which are abundant in carbonic acid and sulphuretted hydrogen gases, and they are strongly chalybeate. They occur in various parts of the plain, and some of them are so near the hot springs that the thumb may be placed in one of the former, the temperature of which is 70° or 80°, and the first finger of the same hand in one of the latter, at the temperature of 190° or 200°. The ground over which the water from the cold springs passes, is covered with a thin coating of oxide of iron, and many of the loose stones have a beautiful metallic stain, which is sometimes iridescent.

From these appearances I was suspicious of the existence of iron pyrites in the vicinity, and caused the earth, in a number of places, to be removed to the depth of five or six feet. In the course of these examinations, a quantity of black mud, of an almost insupportable odour, was thrown up. In one place we came to masses of rock that proved to be pure and distinct basalt. The masses were from a foot, to a foot and a half thick, and externally appeared as if portions had been broken off, leaving many convex fracture-surfaces. The colour of this basalt is greyish black, inclining to bluish; its texture is nearly as compact as that of lydian stone. It is wholly free from vesicles, and contains but very few and minute specks of olivine. Its fracture is perfect large conchoidal, almost equal to that of some of the Icelandic obsidian. The fragments are sharp edged and give sparks with steel. Having removed a number of masses of the basalt, we were at length rewarded by the discovery of an abundance of sulphuretted iron; a great quantity of which was thrown up. Most of the pieces were as large as a man's head, with an irregularly globular form. The surfaces are deeply indented, and full of botryoidal prominences. These pieces have a black colour, and but little metallic lustre externally; but when broken they exhibit the usual aspect of iron pyrites, and appear to have been formed by successive depositions. Internally they have a fibrous structure. On some pieces there is a slight degree of pavonine tarnish. The masses are not all equally compact, but some of them are in different states of decomposition. A part of the specimens which I brought away, have undergone a gradual alteration, and are now in the state of a greyish powder, in which, green, transparent crystals of sulphate of iron have formed.*

The bed of pyrites thus discovered, enables us at once to account for all the phenomena in this spot, and there can be little doubt that the sublimation of the sulphur, the heat of the water, and the chalybeate properties of the springs are to be attributed solely to the decomposition of this substance.

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* While engaged in procuring these specimens, I was told that copper had been found in one of the neighbouring mountains. Some pieces were afterwards brought to me; they had evidently been smelted and partially wrought. I saw no indications of the existence of this metal in any part of the island.

The specimens of sulphur, which I obtained during this examination, are magnificent. The under surface of the layers of siliceous sinter was completely covered with crystals, and thick, masses of sulphur of the utmost beauty. Owing to the ease with which the incrustations were detached, and the specimens destroyed, I found it necessary to take masses of great magnitude, to be broken up at home. In this manner I have succeeded in preserving some fine pieces.

A particular description of that part of the island, beyond the valley of the Furnas, would be a repetition of most of the preceding pages. The land continues high, and the mountains are somewhat more closely connected with each other, their summits often presenting a considerable plain, approaching to what geologists term table-land. The most remarkable mountain, towards the eastern extremity of the island, is the peak, called Pico da Vara, which may be estimated at not less than five thousand feet above the sea.* This is the only summit on which snow is occasionally seen, but it has never been known to remain a longer time than forty-eight hours. Pico da Vara terminates the range of craters, which extend through the centre of the island.

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* This is inferred from a comparison with mountains measured prior to the accident, that befel my barometer.

A little to the northward of Ponta da Ajuda, a few compact masses of a rock are visible at low water, having a more distinct columnar form than the lava and rocks in any other part of the island. They are all imperfectly pentagonal, having a considerable crystalline aspect on the fresh fracture, and can with difficulty be distinguished from some of the basalt of Saxony.

At the base of the mountains on this part of the island, are large patches of rich soil, sometimes more than six feet in depth, in which, stumps and branches of trees, (mostly cedar and beech,) are found in a state of great preservation, leading to the belief, that the island was once well stocked with heavy timber, of which a dwarfish growth only is now seen.

CHAPTER XIX.

CHEMICAL EXAMINATION, AND MEDICAL PROPERTIES OF THE WATER OF THE FURNAS.

I HAVE already remarked that the earthy matters are rapidly deposited from the water of the hot springs as the temperature decreases; hence no examination of the water, at a distance from the springs, can be very satisfactory. The slight experiments, made on the spot, by Dr. Gourlay of Madeira, and published in the Medical Commentaries for the year 1791, lead only to the general inferences that the waters contain sulphuretted hydrogen and carbonic acid gases, iron, and alumina. Dr. Gourlay has divided the springs into four classes, viz. cold, moderate, boiling, and steaming; in the last he detected only sulphuretted hydrogen and alumina. The presence of silex appears to have been entirely overlooked.

Not being prepared to institute any experiments on the spot, I filled a number of bottles with the water from the different springs, and secured them with all possible care. On opening them shortly after my arrival in the United States, I found that a copious precipitation had taken place, which consisted principally of alumina, and iron. The odour of sulphuretted hydrogen was perceptible, but in a much less degree than in the water at the springs. In those bottles, which had been filled at the cold springs, the carbonic acid gas was abundant.

The following experiments may afford some general views of the chemical character of those portions of the water, which were selected as retaining their peculiar properties most perfectly.

WATER FROM THE COLD SPRINGS.

Specific gravity 0.99909

Oxalate of ammonia added to a portion of the water, produced no alteration.

Tincture of litmus produced a slight degree of redness.

Acetate of barytes produced a slightly opaque cloud, which was not removed by nitric acid.

A portion, to which tincture of galls was added, after standing forty-eight hours, presented a purple precipitate.

The addition of a few drops of acetate of silver produced a white cloud, which was unaltered by nitric acid.

Nitrate of lead caused no change in portions of the water which had not been boiled, but in those which had been it produced a slight cloud, that was removed by nitric acid.

Acetate of lead threw down a precipitate that was redissolved by nitric acid.

Neither ammonia nor muriatic acid produced any change.

The triple prussiate of potash produced a slightly blue cloud, after standing forty-eight hours.

Tincture of turmeric, and alcohol, produced no visible effects.

From these trials we may infer the presence of iron, muriatic, sulphuric, and carbonic acids, alumina, and magnesia. By the evaporation of one hundred cubic inches of this water, to dryness, a reddish brown powder was obtained which weighed 8.77 grains. This was chiefly iron; but from the escape of the two most abundant gases, and the consequent deposition on the sides and bottom of the bottles, it is evident that the quantity of residual matter obtained by the evaporation, was far less than it would otherwise have been.

To my friend Prof. J. F. Dana, of Dartmouth College, I am indebted for the following examination of a bottle of the water from the hot springs, which was taken immediately from the great *caldeira*, and secured as soon as its temperature would permit.

ACTION OF REAGENTS.

1. Tincture of soap produces turbidness.
2. Litmus paper is changed to a red by the water before it has been boiled, but no change is produced by the boiled water.
3. Nitrate of silver produces a slight milkiness, and after a few minutes the liquid becomes dark and brownish.
4. Tincture of galls produces no immediate effect, but after standing a few minutes a violet colour is developed.
5. Carbonate of ammonia and phosphate of soda detect no magnesia in this water.
6. Oxalate of ammonia } produce no change.
7. Muriate of barytes }
8. Acetate of lead produces a milkiness, and after standing twenty or thirty minutes becomes brownish; the milkiness disappears on addition of nitric acid.
9. Turmeric paper is reddened by the concentrated water.

Hence we are to look for carbonic acid, sulphuretted hydrogen, iron, a muriate, an alkaline carbonate, and perhaps silex.

ANALYSIS.

1. One pint of the water evaporated to dryness affords 2.85 grains of solid mater.
2. On the dry residuum, warm distilled water was poured; by which a portion was dissolved that weighed one grain; this consisted of a muriate, (probably of soda,) in small quantity, and also of an alkaline carbonate; it afforded a precipitate with muriate of platina and with tartaric acid; it was therefore carbonate of pot-ash.
3. The portion, insoluble in water, was digested in muriatic acid; a part of it was dissolved with effervescence; the insoluble part was found to be pure silex, and weighed 0.5666 grain.
4. The portion dissolved by the acid was carbonate of iron; it gave an amethystine colour to borax, and therefore contained a trace of manganese; its weight was 1.2834 grain.
5. By boiling and collecting the gas in the usual method over mercury, it was found, that one pint of water yielded 26.4 cubic inches, which consisted of carbonic acid gas with a trace of sulphuretted hydrogen.

From the above analysis it appears that one pint of this water contains :

(1.) Carbonic acid with a trace of sulphuretted hydrogen	26.4	cubic inches.
(2.) Carbonate of potash, with a trace of muriate of soda	1.0000	grain.
(4.) Carbonate of iron, with a trace of manganese	1.2834	"
(3.) Silex	0.5666	"
	2.8500	

These waters, as would be readily anticipated, are exceedingly beneficial in many diseases and during the summer months, the valley of the Furnas is the resort of all classes of persons on the island. They indulge to excess in the warm baths, remaining in them longer than an hour daily, for weeks. No debilitating effects follow, but the whole system is invigorated, and the spirits are exhilirated. I had little opportunity of judging of the good effects of these waters in disease, but heard of many cases, particularly of chronic rheumatism, scrofula, and cutaneous affections, in which cures had been effected by the use of them. Dr. Gourlay in the paper above referred to, has related a number of cases, and very correctly remarks that " when the waters of the cold springs are drank, they prove both laxative and diuretic, and also promote the excretion by the surface. As the inhabitants are totally ignorant of the virtues of the cold springs, and also of the use of the vapour bath, I had an opportunity," he continues, "of making them acquainted with the properties of the former, and likewise of demonstrating the active power of the latter, in several cases."

From a number of these cases, the following is selected. "A young man, aged twenty, had been attacked with a violent rheumatism, which brought on a contraction of the joints in his lower extremities, particularly in the flexors of his knees. This contraction was so great, as to bring his leg nearly in contact with his thigh, and his knees were actually touching each other; nor could he separate them more than a couple of inches, and that only at particular times. In this unhappy situation he had been confined to his bed for nearly five years. On applying to me, I directed him to use the vapour bath; a chair was made for the purpose; it was so constructed as to include the whole body, leaving the head free at the top, where there was an aperture, which could at pleasure be opened or closed, for the purpose of regulating the heat. This chair was placed upon the ground, whence the sulphureous exhalation issued. He remained in it seven minutes the first time, and was thrown by it into a profuse perspiration. On using it a second and third time he experienced sensible relief; he could sit out of bed, stretch his leg to an obtuse angle with the thigh, separate his knees, and even walk on crutches. He continued the use of the bath for three weeks, at the end of which time, his family concerns called him home; but he went away much recovered, and was convinced of the very great efficacy of the vapour."

From the general effect of the hot waters, and the decidedly tonic properties of the cold, they appear to be peculiarly adapted to all the formidable diseases originating in general debility, and a disordered state of the digestive organs.

The indolence and luxury of the Azoreans, produce various organic diseases, and dyspepsia and dropsy carry off many of the inhabitants. Acute inflammatory affections are comparatively rare, and cases of fever are seldom seen. The medical treatment varies but little in any case; venesection and mercurials are universally prescribed, and salivation is deemed essential in almost every disease. The treatment of the cutaneous diseases, which are very common, is exceedingly inert, and even this is rendered much less effective, by the popular belief that all applicacations are injurious. Of all the diseases, *psora*, (here termed *sarna*,) is perhaps the most common among the lower classes, but is by no means confined to them; no ideas of disgrace or disgust seem to be attached to it. Cases of leprosy are now and then seen, and occasionally the true elephantiasis.

During the vintage, a few cases of dysentery and cholera occur, but are readily subdued. The popular and almost universal remedy for these diseases, is " xarópe de vinaigre," made of equal parts of vinegar and water, with a small quantity of sugar. About a pint of this is taken as hot as it can possibly be swallowed; a profuse perspiration is the consequence, and the disease it is said, soon subsides.

A residence in St. Michael, has often been recommended to consumptive patients, but although the temperature is mild and equable, there is, not unfrequently, a considerable degree of dampness, which is productive of unpleasant effects. The houses being of stone, and without fire places, the phthisical subject is unable to guard against those slight atmospheric changes, which, although almost unnoticed and unfelt by those in health, are, to him, sources of some of his most unpleasant, and depressing sensations. The temperate and uniformly dry atmosphere of Madeira, is on many accounts to be preferred by the invalid.

Although the climate of Saint Michael cannot be safely recommended to consumptive persons, it is nevertheless rare to see this disease in a native; but in Madeira, as appears from the observations of Dr. Gourlay, no disease is more common.

APPENDIX.

ISLAND OF FAYAL.

Next to St. Michael, Fayal is more known to foreigners than any other of the Western Islands. It has a circular form, and rises, for the most part, abruptly from the sea. On the eastern side of the island there is a beautiful semicircular bay, about two miles broad, and rather more than half a mile in depth, at the bottom of which is Horta, the principal town. The depth of water varies from eight to twenty fathoms, and vessels lie at anchor in the bay with safety, except when the wind is S. E. or S. S. W.

The appearance of the island from the anchorage is exceedingly picturesque. The city is seen at the foot of a grand amphitheatre of mountains, which, according to Mr. Masson, are crested with the luxuriant evergreen, the *faya*, or Azorean candleberry myrtle.* The land is under good cultivation, and towards the centre of the island attains the height of nearly three thousand feet above the level of the water. The highest part appears to be formed by the edge of a crater; the walls of which, slope gently down on the inside, and are covered with short shrubs affording pasturage for sheep and cattle. The plain at the bottom of this crater is nearly five miles in circuit; and is covered to the depth of four or five feet with water, the surface of which is supposed to be on a level with the waters of the ocean.

The specimens I have obtained from Fayal consist of compact bluish lava, pumice, and tuff. The general characters of these substances are similar to those of specimens from St. Michael, and the lava contains basaltic hornblende, and olivine. The specimens are quite sufficient to prove the great resemblance of the two islands, as regards their geological structure. The volcanic origin of Fayal is unquestionable, and accounts of eruptions on the island are on record. The crater just noticed was probably formed by the last event of this kind, which occurred in the year 1672.* The island is subject to earthquakes, and one of great violence was experienced in the year 1764, but those of late years have been comparatively slight.

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* The name Fayal is generally supposed to have been derived from the Portuguese word *faya*, signifying "the place where *beech* trees grow." The faya, however, is a species of myrtle, (*myrica faya.*)

The temperature of Fayal is not more variable than that of St. Michael; the thermometer in the depth of winter being usually above 50°, and in summer below 80°.

The productions of this island are similar to those of St. Michael. A considerable quantity of oranges and lemons are annually exported from Fayal, but they are not so extensively cultivated as in St. Michael. Apricots are so abundant that large quantities of them are sent to the neighbouring islands. Flax is very generally cultivated, and is manufactured by the inhabitants. Although very considerable quantities of wine are annually exported from Fayal, none is made there for foreign markets, and not even sufficient for home consumption ; all the wine, which is exported from the island, is the produce of Pico.

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* Mr. Adanson remarks, that this eruption "left a large basin, which, according to the testimony of the inhabitants, has the figure of a parallelogram, surrounded with a very high wall, and so regular that one would take it to be done by art, if we did not know for certain, that it owes its origin to subterraneous fires. The rain waters have now filled this basin, and formed it into a kind of lake, or, to express myself more properly, a reservoir of fine water, greatly admired by the inhabitants." *Voyage to Senegal.*

The whole number of inhabitants in Fayal is now estimated at twenty-two thousand.* The manners and customs of the natives differ in no respect from those of the natives of St. Michael, but in the principal town, owing to the greater number of foreign settlers and visiters, the society is much more varied and refined.

PICO.

The island of Pico is not the least remarkable of the Azores, and takes its name from its lofty peak, which is about nine thousand feet above the level of the sea. Mr. Adanson, who visited it in the year 1753, estimated the height at "hardly more than half a league ;" but later observations, made on board British ships of war, give the result first mentioned. The summit of Pico, situat-

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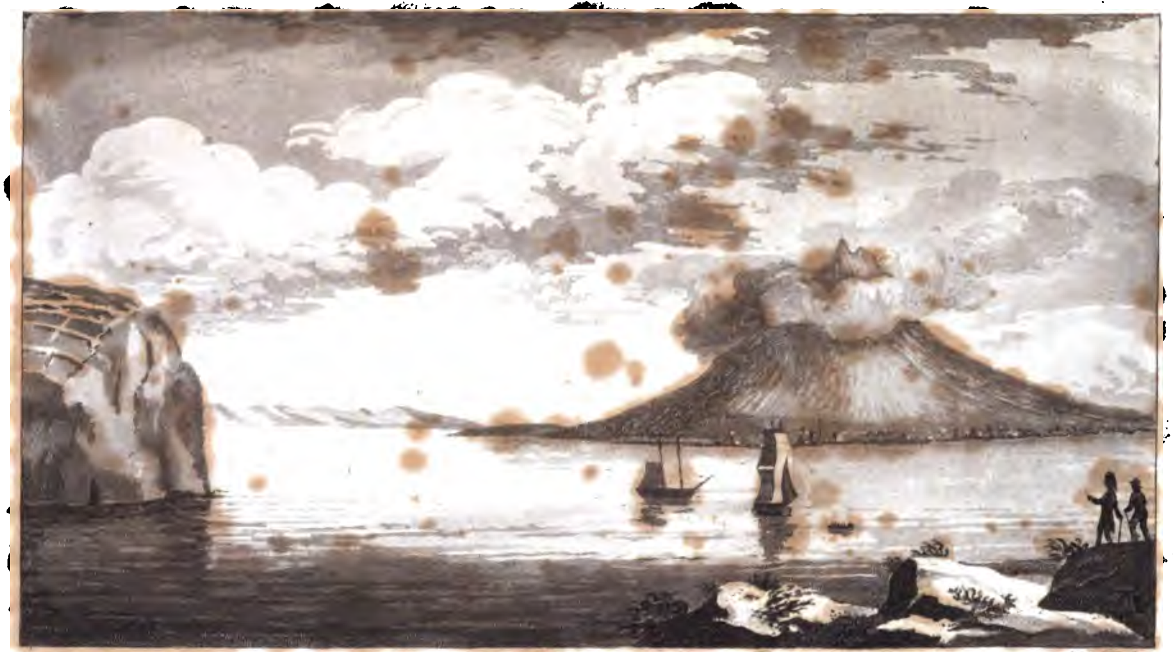
* According to Hassel, the population of Fayal, in the year 1790, was sixteen thousand two hundred and ninety four.



Annin & Smith Sc.

Pico and St. George from Fayal.

ed as it is nearly in the middle of the Atlantic ocean, has been proposed as a good first meridian of longitude. It is visible, according to Don M. Cagigal, at the distance of one hundred and twenty-six miles. The peak is generally capped with snow, and is rarely free from heavy clouds. The outline of Pico is different, as viewed from different situations. From Fayal its form is that of an immense cone, terminated by a crater, the sides of which seem to have been broken down in such a manner, as to present the appearance of two smaller cones at the summit.

The island is immediately opposite Fayal, from which it is separated by a channel about nine miles wide. The country seats of most of the gentlemen of Fayal are on the island of Pico, which, during the vintage, is resorted to by all classes of people. The grape is extensively cultivated, and many thousand pipes of wine are annually made. As there is no harbour or safe anchorage excepting for boats, the wine of Pico is shipped from Fayal, and is generally known by the name of Fayal wine. Much of it is exported to the West-Indies, and to the United States. The wood of Pico, which is often mentioned by authors as being very similar to mahogany, and susceptible of a fine polish, appears to be a species of yew. Considerable quantities of it were formerly sent to Lisbon, where it was manufactured into work tables, writing desks, and similar articles of furniture.

Pico is entirely composed of lava, and so little soil covers it, that, as I am informed by Mr. Dabney, the American consul at Fayal, earth is purchased on the latter island at five cents per bushel, and transported across the channel. Little soil, however, seems to be required for the vines, which, sending their roots among the crevices in the lava, thrive luxuriantly.

The number of inhabitants in Pico is estimated at twenty-four thousand. The length of the island is about twenty-five miles; its width is irregular, and does not much exceed eight miles at the widest part.

The following account of an ascent to the summit of Pico is from the Travels of G. Heriot, Esq.

"From the village of Guindaste to the summit of the peak, the distance is stated to be nine miles. The road passes through a wild, rugged, and difficult country, which is entirely covered with brushwood. When, at seven o'clock in the morning, we arrived at the skirts of the mountain, which form the region of the clouds, the wind became extremely cold, attended by a thick mist; the thermometer falling to forty-eight degrees, and at 8 o'clock to forty-seven.

In alluding to the degrees of cold, I must be understood to speak relatively, and only with respect to its influence on the human frame, which a sudden change of twenty-two degrees of temperature cannot fail to effect. About ten, we arrived at the boundary of the ancient crater; and the sun then acquiring power, the thermometer rose to forty-eight degrees. This appears to have been more than a mile in circumference. The southern and western boundaries yet remain; but those of the north and east have given away, and have tumbled down the side of the mountain.

In the centre of the old crater, a cone, of three hundred feet in perpendicular height, is thrown up, on the summit of which is the present mouth. The ascent of this is very steep and difficult; and it contains several apertures from which smoke is emitted. It is formed of a crust of lava, of the consistence of iron, that has once been in a state of fusion.

At the hour of half past ten, we gained the top of the peak, which is singularly sharp and pointed, being about seven paces in length, and about five in breadth. The crater is on the north side, and, below the summit, is about twenty paces in diameter, and is continually emitting smoke. It is almost filled with burnt rocks. From hence, several of the neighbouring islands are presented to the view. Pico, seen from the peak, exhibits an appearance no less singular than romantic; the eastern part rises into a narrow ridge, along which are many ancient volcanoes, which have long ceased to emit smoke, and several of whose craters are now almost concealed by woods, which have sprung up around them. The basis of the peak presents likewise some remains of smaller volcanoes, whose fires are now extinguished. The last eruption of the peak, which happened in 1718, burst forth from its side, and destroyed a great part of the vineyards."—"Upon a comparison of observations made at the same periods with the thermometer on the peak, and at Fayal, they were found to be as follows.

FAHRENHEIT'S THERMOMETER.

		Fayal.	*On the Peak.*
Morning	Eight o'clock,	69°	47°
	Ten,	70°	49°
	Ten and a half,	70°	53°
	Twelve,	71°	50°

ST. GEORGE.

The island of St. George is rather longer than Pico, but is much narrower, not exceeding five miles across in any part. Its population is variously estimated at from eight to ten thousand inhabitants. It produces good wheat, but no wine. A few years since the island suffered much from a volcanic eruption, the following account of which by J. B. Dabney, Esq. is, with his permission, here given.

"*Fayal, Azores, June,* 1808.

"A phenomenon has occurred here, not unusual in former ages, but of which there has been no example of late years; it was well calculated to inspire terror, and has been attended with the destruction of lives and property. On Sunday, the first of May, at one P. M. walking in the balcony of my house at St. Antonio, I heard noises like the report of heavy cannon at a distance, and concluded there was some sea engagement in the vicinity of the island. But soon after, casting my eyes towards the island of St. George, I perceived a dense column of smoke rising to an immense height. It was soon judged that a volcano had burst out about the centre of that island, and this was rendered certain when night came on, the fire exhibiting an awful appearance. Being desirous of viewing this wonderful exertion of nature, I embarked on the third of May, accompanied by the British consul, and ten other gentlemen, for St. George; we ran over in five hours, and arrived at Vellas, the principal town at eleven A. M. We found the poor inhabitants perfectly panic struck, and wholly given up to religious ceremonies and devotions. We learned that the fire of the first of May had broken out in a *lake* in the midst of fertile pastures, three leagues S. E. of Vellas, and had immediately formed a crater, in size about twenty-four acres. In two days it had thrown out cinders, or small pumice stones, which a strong N. E. wind had propelled southerly; and which, independent of the mass accumulated round the crater, had covered the earth from one to four feet in depth, half a league in width, and three leagues in length; then passing the channel five leagues, had done some injury to the east point of Pico. The fire of this large crater had nearly subsided, but in the evening preceding our arrival, another small crater had opened, one league north of the large one, and only two leagues from Vellas.

After taking some refreshment, we visited the second crater, the sulphureous smoke of which, driven southerly, rendered it impracticable to attempt approaching the large one. When we came within a mile of the crater, we found the earth rent in every direction, and as we approached nearer, some of the chasms were six feet wide. By leaping over some of these, and making windings to avoid the large ones, we at length arrived within two hundred yards of the spot, and saw it in the middle of a pasture, distinctly, at intervals, when the thick *clouds*, which swept the earth, lighted up a little. The mouth of it was about fifty yards in circumference, the fire seemed struggling for vent; the force with which a blue flame issued forth, resembled a powerful steam engine, multiplied a hundred fold; the noise was deafening, the earth where we stood had a tremulous motion, the whole island seemed convulsed, horrid bellowings were occasionally heard from the bowels of the earth, and earthquakes were frequent. After remaining here about ten minutes, we returned to town, the inhabitants had mostly quitted their houses, and remained in the open air, or under tents.

We passed the night at Vellas, and the next morning went by water to Ursulina, a small seaport town two leagues south of Vellas, and viewed that part of the country covered with the cinders before mentioned, and which have turned the most valuable vineyards in the island into a frightful desert.

On the same day, the 4th of May, we returned to Fayal, and on the fifth and succeeding days from twelve to fifteen volcanoes broke forth in the fields we had traversed on the third, from the chasms before described, and threw out a quantity of lava, which travelled on slowly towards Vellas. The fire of those small craters subsided, and the lava ceased running about the eleventh of May, on which day the large volcano, that had laid dormant for nine days, burst forth again like a roaring lion, with horrid belchings, distinctly heard at twelve leagues distance, throwing up large stones and an immense quantity of lava, illuminating at night the whole island. This continued with tremendous force until the fifth of June, exhibiting the awful, yet magnificent spectacle of a perfect river of fire, distinctly seen from Fayal, running into the sea. On that day, (the fifth,) we experienced that its force began to fail, and in a few days it ceased entirely. The distance of the crater from the sea is about four miles, and its elevation about three thousand five hundred feet.

The lava inundated and swept away the town of Ursulina, and country houses and cottages adjacent, as well as the farm houses throughout its course. It as usual gave timely notice of its approach, and most of the inhabitants fled; some, however, remained in the vicinity too long, endeavouring to save their furniture and effects, and were scalded by flashes of steam, which, without injuring their clothes, took off not only their skin, but also their flesh.* About sixty persons were thus miserably scalded, some of whom died on the spot or in a few days after. Numbers of cattle shared the same fate. The judge, and principal inhabitants, left the island very early.

The consternation and anxiety were, for some days, so great among the people, that even their domestic concerns were abandoned, and, amidst plenty, they were in danger of starving. Supplies of ready baked bread were sent from hence to their relief, and large boats were sent to bring away the inhabitants, who had just lost their dwellings. In short, the island, heretofore, rich in cattle, corn and wine, is nearly ruined, and a scene of greater desolation and distress has seldom been witnessed in any country."

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* Sir William Hamilton mentions similar circumstances attending an eruption of Vesuvius. (*W.*)

In the year 1757, many of these islands were shaken by earthquakes, the first of which lasted two minutes. The waters of the ocean rose very considerably, and ruin and desolation ensued, with the loss of many lives. During these convulsions, eighteen small islands rose from beneath the waters, about ten yards distant from St. George like the island Sabrina they soon, however, disappeared.

ST. MARY.

St. Mary is the most southern island of this group ; its circumference is about thirty miles, and it presents on every side lofty mural precipices. The interior of the island is fertile, and it contains about five thousand inhabitants. The principal town is Santa Maria le Prainah.

Considerable quantities of coarse earthen ware are made in this island.

Between the eastern extremity of St. Michael, and the island of St. Mary, is a dangerous ledge of rocks, called the Formigas, or Ants. They extend about two leagues N. E. and S. W. and are laid down on Mr. Read's chart as bearing S. S. E. from Ponta Delgada, at the distance of twenty-one leagues. They project from the water, and at night appear like ships.

GRACIOSA.

This island is about ten miles in length and eight in breadth, and contains between seven and eight thousand inhabitants. Its name is expressive of its great fertility and beauty. It is less abrupt than most of the other islands, but rises at each extremity into mountains, that, when viewed from some situations, give it the appearance of two islands. The productions of Graciosa are principally wheat, and grapes, the latter are however inferior to those of Pico, and the wine obtained from them is converted into brandy. From five to six pipes of wine afford one of brandy. There are some pastures on the island, and the inhabitants export butter and cheese. The principal town is Santa Cruz.

FLORES AND CORVO.

The island of Flores probably derived its name from the abundance of its flowering shrubs, and is a beautiful island, nearly thirty miles in length and nine in breadth. It is at this time estimated to contain between thirteen and fourteen thousand inhabitants. The principal town is Lagens.

Viewed from the north-west, the mountains of Flores appear cultivated to their summits, and cascades are seen precipitating their waters into the sea.

Corvo is seldom visited by strangers and appears to be little else than a barren rock. It contains, however, seven hundred inhabitants, all of whom are wretchedly poor. They export a few hogs and some wheat to the other islands.

TERCEIRA.

All these islands, by a regulation made by the court of Lisbon in 1766, were united under one governor, whose residence was fixed at Angra, the capital of Terceira. This island is about fifty-four miles in circumference, its greatest length is nearly twenty-five miles. It contains between twenty-five and twenty-eight thousand inhabitants. The capital is situated on the southern side of the island, at the edge of the sea, and at the bottom of a harbour formed by a point of land called Mont de Brazil; it is fortified and defended by a strong castle, famous for the imprisonment in it of Alphonso V. by his brother Peter, in 1668. There are three monasteries, four nunneries, and numerous churches in the city of Angra, and it is the place of residence of the Bishop of the Azores.

"The island is fertile, pleasant, and healthy; the very rocks, which elsewhere are dry and barren, produce here excellent vines, though not equal to those raised in the Canaries and Madeira. The land yields large crops of wheat and other grains, pasture for cattle, and a prodigious variety of lemons, oranges, and all those fruits peculiar to hot and cold climates, which are observed to be propagated to the greatest advantage in temperate countries."*

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* Mod. Univ. History.

The specimens of lava which I have received from Terceira, are perfectly black, compact, and almost vitreous, having characters intermediate between those of the lava of St. Michael, and obsidian.